TO THE
WORSHIPFUL
AND
LEARNED,
THE
Provoſt and *Fellows*
OF THE
UNIVERSITY
OF
DUBLIN.

EVery Man, tho' never ſo much exempted from the Imputation of Vanity, has ſuch a natural Affection for his own Off-

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Offſpring, as to procure the beſt Sureties he can to promiſe for it. And tho' the Requeſt be generally unreaſonable, yet as it paſſes rather upon a Claim of Favour than Merit, it is ſeldom refuſed.

I can't pretend to ſay there are any Features in this ſo much reſembling my *Alma Mater*, as to engage her in its Favour upon any Grounds. I dare go no farther than to mention, that it is the Product of thoſe Seeds ſown early under her Indulgence; and ſince tranſplanted into a foreign Climate, famous for a Cultivation of them under one of the greateſt Maſters of his Profeſſion. I wiſh I could ſay the Soil he had to manage, were any way capable of ſhewing

ing the Effects of his exact Skill: But I thought the firſt Fruits, however unripe, and green, were ſurely due as a Tribute of Gratitude at home.

There is indeed another Conſideration that encourages this Addreſs, and gives me Hopes that even a languid Attempt of this Nature, will meet with a favourable Reception. The Univerſity of *Dublin* has of late Years been as famous for an induſtrious Cultivation of the true, genuine Philoſophy, as any Seminary of Learning in the World. And I believe every Body will allow, there cannot be a greater Demonſtration of this, than what appears to ſuch Advantage upon an Examination for Fellowſhips, both in

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the Governors and Youth who undergo the painful Trial; which is become ſuch a Teſt of Abilities as is hardly any where elſe to be found.

It is with the moſt ſenſible Pleaſure we every day obſerve this Progreſs of ſound Philoſophy, as well as polite Literature, in the place of our Education; and from thence diffuſed into other Parts of the Kingdom: And were there but ſome proper Encouragements added to a uſeful Phyſick Garden, and other Branches of the Profeſſion; What ſhou'd hinder our Youth from building as beautiful Superſtructures of natural Science and Medicine on a home Foundation, as by ranging for Materials abroad?

That Air of true Wit, and Senſe, which we have lately obſerved in our own Countrymen, even in ſmaller Performances in Print, may extend this Obſervation farther, and ſhews plainly that neither a right Genius for all Branches of Wit and Learning, nor a true Improvement of it are wanting among us, were the Diſcouragement removed.

I know there is an envious Principle ſtirring, which will as unwillingly allow us to rival our Neighbours in Wit and Science, as in Trade: But our Comfort is, they will find a Monopoly of the Firſt, much harder than of the Laſt. The Effect of being cramp'd by Diſcouragement is only this in both Inſtances; we ſhall deal the more in run Goods, ſince we are not allowed the Benefit of free Traders.

I have ſometimes wondered why ſince our Preſs has been brought to ſo great a Perfection in this Kingdom, there has not yet been made publick any Eſſay in the Art of Healing, nor any of theſe uſeful Lectures read heretofore among us on the Preliminaries of it. If this Tract ſhould prove nothing more but a Provocative to this Purpoſe, I have my End. And ſince 'tis an Adventurer on this Errand, I hope our *own Countrymen* (*at leaſt*) will not treat every thing of this ſort *which comes not from England*, as contraband Goods, and immediately deſpiſe it, as the Humour has too much prov'd in other Caſes, for being of our own Growth.

I can't pretend that any Thing in it will be render'd current for being truly Sterling. Our Country has been ſo commendably ſagacious of late in diſcovering the Counterfeit, and Alloy both in Metal, and Senſe, that I dare urge Nothing more in its Favour, but that it is ſtamp'd at Home, and is neither fraudulently nor vainly meant.

I am, SIRS,

Your moſt Obedient,

Humble Servant.

Corke, 1 June, 1725.

E. BARRY.

To His Excellency

The Lord *Carteret*,

Baron of *HAWNES*, and
Lord Lieutenant of
IRELAND.

WHEN Perſons in the higheſt Stations, like your Lordship, are eminently diſtinguiſhed for making the Good of Mankind their peculiar Care, they have an undoubted Right to the Homage of all thoſe, who, in a more humble Sphere, purſue that amiable End: While theſe on the other Hand, lay Claim to, and think themſelves in ſome Degree entitled to their Protection.

AND tho' this muſt often expoſe them to the impertinent Addreſſes of ſuch who *but* impotently ſtrive to promote the publick Welfare; yet to one of your LORDSHIP'S Candor, the ſincere Intention will in ſome Meaſure ſupply the Place of more ſucceſsful Merit, and plead an Excuſe for this Preſumption.

THE Enquiries which have been made into the Structure and Uſe of the various Parts of Animal Bodies, have been always attended with great and diffuſive Benefits. Several mechanic Engines owe their Origine to Hints firſt taken from ſmall Machines of the ſame Form in a human Body; and ſome of the moſt curious Pieces of Art, and Productions of Nature, have been there diſcovered in a beautiful Miniature. Sculpture, and Painting, could not have arrived to ſuch a Perfection, unaſſiſted with the previous Improvements in *Anatomy*: And the ſurpriſing Contrivances that have been obſerved in the Fabric of the Ear, have not a little contributed to make Muſic charm more powerfully. The great Reſemblance that has always appeared between the Body Politic, and Natural, makes the latter particularly worthy of the Encouragement, and Study of the greateſt Stateſman. Thus *Menenius Agrippa*, by his famous Apologue deduced from the Structure of the Body, prevailed on the mutinous *Plebeians* to acquieſce in the Authority of the Laws. Had he been unacquainted with this Sort of Knowledge, the Republic then in its Infancy, might have been deſtroyed by civil *Feuds*, and *Rome* perhaps had never been the Miſtreſs of the World. However theſe Advantages, MY LORD, tho' very conſiderable, are by no Means equal to ſuch as flow from a judicious Exerciſe of the *Art* of *Phyſic*; on which often depends the Safety of the beſt Patriots, and of ſuch who are moſt capable of improving all other Arts, and Sciences.

SINCE then the due Cultivation of *Medicine* is of ſuch Uſe to Mankind, ſince the moſt refin'd and elegant Enjoyments of Life grow inſipid where Health is wanting, ſince without it, we could not reliſh even *theſe happy Days*, nor have a true Flavour of the unuſual Bleſſings we enjoy under your wiſe, and auſpicious Adminiſtration, permit me, MY LORD, to lay before You, this faint Eſſay in the *Art of Healing*. *You* make us every Day more in *Love* with *Life*, by making us every Day more *happy* in it, and conſequently make the *Art* of *Phyſic* of ſtill the greater Importance.

THE univerſal Reputation YOUR LORDSHIP enjoys in being skill'd in every Part of uſeful Knowledge, Your thorough Acquaintance with the Ancients, Your forming Your Mind (where You thought the Moderns imperfect) on their Model, the greateſt of whom made it ſo much their Care to be verſed in the *Art* of *Phyſic*, that it was even thought a neceſſary Part of a polite Education, make me believe I have choſe the beſt and trueſt Critic, as I'm ſure

I have the worthieſt Patron of the following Sheets.

I am,

Your Lordſhip's

moſt obedient,

humble Servant,

EDWARD BERRY.

THE

THE

PREFACE.

WHILE other Arts and Sciences have been greatly advanced, and brought almoſt to a perfection, the Progreſs of Phyſic has been ſo very ſlow, that for the ſpace of above two thouſand Years it received but few real Improvements; but by the Labour and miſapply'd Induſtry of its Profeſſors was loaded with Errors and involved in uſeleſs Intricacies.

This unhappy Fate of Phyſic, is in a great Meaſure owing to the Number of *Sects*, and deluding *Hypotheſes* that have been admitted to explain the Cauſes of Diſeaſes, while their Patrons have partially advanced whatever may gain credit to their fatal Schemes, and have neglected the true Methods by which this Art may be improved.

Whoever takes a juſt View of the Writings of former Phyſicians, and of the various Revolutions this Science has paſſed through, will find that little truly valuable has been added to it from the Time of *Hippocrates* to that of *Harvey*, but what has been received from the *divine old man*; and that the large Volumes of ſucceeding Authors, have increaſed, and ſwelled to ſuch a bulk, not by new real Improvements, but by Repetitions of what he wrote before, and applying a falſe Philoſophy to his Obſervations; and even his Works if purged from Errors, may be reduced to a ſmaller Size, for if his Notions of the *Elements*, and their *Influence* of *Attraction*, and *Antipathy*, *Celeſtial Cauſes* and *Anatomical Errors*, are excepted, which greatly enlarge the Bulk of his Writings; what remains conſiſts of a ſmall

Collection of Obſervations, which are plain, and obvious to the Senſes, and as they are the conſtant Footſteps of Nature, will always retain that Eſteem they have ſo long maintain'd, and continue to bear the ſevereſt Teſt of ſucceeding Ages.

This great Author is moſt valuable for his exact Deſcription of the natural Progreſs, and Event of Diſeaſes: *Aretæus Cappadox*, and *Rufus Epheſius*, purſued the ſame Method. The former deſerves particular Notice, for having been the firſt that reduced into Order, what *Hippocrates* publiſhed in a confuſed Manner; *Galen* likewiſe was very ſerviceable in collecting the *Diagnoſtics*, and *Prognoſtics* of Diſeaſes, which lay ſcattered in the Writings of former Phyſicians; but did great Prejudice to Phyſic, in introducing the *Peripatetic Philoſophy*, and thence explaining the Cauſes of Diſeaſes: By this means the Art continued unimproved, but was more involved in Fictions, and deceitful Chimæras, and whoever looks over the large venerable Sect of *Arabians*, *Rhaſes*,

ſes, *Averroes*, *Avicenna*, &c. tho' their natural Sagacity, and the Size of their Volumes, ſeem to promiſe no ſmall Diſcoveries, will find they have only changed the Language of *Galen*, and *Ariſtotle*, and have added little material beſides a few Improvements to the *Materia Medica*.

All the ſucceeding Authors to the time of *Paracelſus*, were Commentators on *Galen*, and paid ſuch an implicit regard to his Notions, that his Text was quoted by them as deciſive, and ſacred; while the Name of *Hippocrates* (particularly among the chief of the *Arabians*) was ſeldom mentioned: But his Doctrine was at length revived in *France* by *Hollerius*, and *Duretus*, and the *Galenic Theory* was violently overthrown by *Paracelſus*; who when he was made Profeſſor at *Baſil*, ordered the Works of *Galen* to be publickly burned.

Chymiſtry being now introduced into Medicine, eaſed it indeed of a great Load of Errors, but ſoon ſubſtituted others more whimſical, and dangerous in their Place; for the ſucceeding Chymical Phyſicians inſtead of obſerving the natural Progreſs, and Event of Diſeaſes, regarded chiefly ſuch *Phænomena* as appeared in their Elaboratory from Experiments tried on particular Bodies, and thence endeavoured to account for the Alterations which are produced in the fineſt Machine in the Univerſe, whoſe Motions are moſt regular, by *Immechanical Ferments*, *Precipitations* and Battles fought between *Salts* of an oppoſite Nature: and at length their Flights were ſo mad, and Enthuſiaſtic, as to ſeek for a Medicine that would univerſally cure all Diſeaſes, and make a human Body immortal, which unavoidably decays by the ſame Cauſes that ſupport it. *Chymiſtry* is without doubt of the greateſt Service to the Art of Healing, when kept within its proper Bounds, as from thence the Knowledge of the Properties of particular Bodies is attained; tho' in being miſapply'd it has retarded its Progreſs: But this Art is now cultivated after a more chaſte and uſeful Manner, which is in a great Meaſure owing to the Induſtry of the ingenious Mr. *Boyle* from whom it received large Improvements.

When the Circulation of the Blood was diſcovered, the Theory of Medicine received new Alterations, and ſuch ſurprizing Diſcoveries have been ſince made in Anatomy, that the moſt minute Canals by Artificial Injections and the uſe of Microſcopes have been expoſed to the Eye, and have ſhewn a more beautiful Harmony through the whole Fabric than was before imagined.

It has been ſince evidently demonſtrated that a human Body is a Machine compoſed of Solids and Fluids; that *Health* conſiſts in having their Circulation free and undiſturbed through ſuch *Canals*, and *Sickneſs* in their Motion being prevented in ſome part or other. The Solid parts are ſo formed as to be fit and appropriated either to *retain*, *direct*, *alter*, or *ſeparate* ſuch Fluids; others are contrived as Mechanic Engines, by whoſe *Form*, *Firmneſs*, and *Connexion*, the Motion of ſuch Fluids is likewiſe promoted, and the whole Frame is propt up and ſupported. On this Account it plainly appears, that the Effects which are produced in ſuch a Machine when in Health or Sickneſs, can only be explained from its *Known Structure*, and from *Mechanic*, *Hydroſtatic* and *Hydraulic Principles*.

'Tis moſt certain that the Mathematicians have given the beſt general Definition of a Body; but from the *General Principles* of Matter, no one can deduce a *Priori* what are the peculiar Properties of any particular Body, and which diſtinguiſh one from another. The only way of attaining ſuch a Knowledge is by making Experiments, and by carefully obſerving the *Phænomina*, and when ſuch are taken for *Data*, and a Geometrical Reaſoning is apply'd to them, we may thence arrive to the Knowledge of the adequate Cauſe of ſuch Effects, and deduce uſeful and certain Axioms, which could not be attained without the Aſſiſtance of ſuch a Calculation.

Every Part of a Fluid ſimply conſidered is a Solid, and therefore the Effects which are thence produced by its *Momentum* and Motion are to be explained after the ſame manner. *Gravity*, and *Fluidity* are the common Properties of Fluids, their various Difference in *Elaſticity*, *Weight*, *Denſity*, *Fluidity*, and *Contact*, are the chief Properties which diſtinguiſh one Fluid from another; and can never be deduced from the *General Principles* of Fluids but from particular Experiments on ſuch Fluids.

A Human Body is of the ſame general Nature of other Bodies, but particularly differs from them in being compoſed of various, and different Machines perpetually agitated with circulating Fluids of a particular Nature; whence the Effects thence produc'd are various, but ſubject to the ſame *Mechanic*, *Hydroſtatic* and *Hydraulic* Principles, as the general Effects produced from all Bodies whether Solid or Fluid; if ſuch *Data* are only made uſe of, which are not the probable Fictions of a luxuriant Imaginamagination, but ſuch as are to be obſerved by the Senſes: So that in applying Mathematics to Medicine, it is required that the known Structure of the parts of a human Body, the particular Nature of the Fluids, and the Effects produced in Health or Sickneſs ſhould be taken for *Data*.

For that any Cauſe ſhould be inveſtigated after a Mathematical manner, it is requiſite that the ſeveral Properties or Powers of ſuch a Cauſe ſhould be known, and then by comparing them together the Knowledge of ſuch a Cauſe may be attain'd, which is adequate to theſe Properties or Effects when joyn'd together. But as the Properties of ſuch Cauſes which produce Health or Sickneſs are not known but by the ſenſible Effects which they produce, it is moſt neceſſary that with the Structure of a human Body, the ſeveral Functions and Effects which are obſervable in a human Body when in Health or Sickneſs muſt be likewiſe carefully ſearched into, and exactly deſcribed, before a juſt and regular Notion can be formed of their Cauſes; and ſuch Effects when known, will have the ſame *Ratio* to the unknown Cauſe as in Geometry the *Data* have to whatever is ſought for. On this Account whoever is unacquainted with the Cauſes of Health, and its Effects, is moſt incapable of explaining and curing Diſeaſes which proceed from a Defect of ſuch cauſes as conſtitute Health: When the Hand of a Clock goes wrong, that Artiſt is only able to correct and alter it with Judgment that underſtands the mechanic Fabric and Action of the ſeveral little Machines that make it point Right.

In the Purſuit of natural Philoſophy, and in arriving to the Knowledge of the Cauſes and Cure of Diſeaſes, the ſame Method muſt be carefully obſerved: Nothing in either Caſe is to be aſſumed that is not evident to the Senſes, nor any Thing that has appeared tho' ever ſo minute is to be neglected. To ſuch *Phænomena* only a Mathematical Reaſoning is to be apply'd, not to falſe or dubious *Poſtulata*, ſuch as the unknown Velocity and Figure of Bodies, which tho' ſupported by the juſteſt Mathematical Reaſoning, will always prove more prejudicial than ſerviceable to Medicine.

It has been greatly diſputed whether the Empiric or the rational Method of Practice, founded on ſome Theory deſerves the Preference. The Advocates for the former have juſtly obſerved, that ſo many contrary *Hypotheſes* have been maintained by different Authors to explain the Cauſes of Diſeaſes and their Method of Cure, that Phyſic has thereby received more Prejudice, and leſs real Improvement, than if it had been only aſſiſted by Obſervations of the natural Progreſs and Event of Diſeaſes, and the Effects of Empiric Medicines. But whoever juſtly conſiders how far the latter can only advance Medicine, will find that the Art muſt always continue obſcure and imperfect without the Aſſiſtance of a true rational Theory, and that the moſt vigorous Part of a Phyſician's Life muſt be paſſed in a long, inactive Courſe of tedious Obſervation, before he can arrive at a ſufficient Degree of Knowledge to make him capable of Practice. It is moſt certain that both are equally neceſſary to make a compleat Phyſician, for whoever is unacquainted with the Obſervations of the Antients, and the regular Appearance of the Symptoms of Diſeaſes, will find Mathematics of ſmall Service in the Cure of them; and whoever is ignorant of the modern Diſcoveries in *Anatomy*, *Chymiſtry* and *Mathematics*, will be very uncertain in his Proceedings, and incapable of underſtanding the true Force of ſuch Obſervations, on the Knowledge of which he ſo much depends: But a Theory founded on ſuch certain Principles as have been laid down, is not Subject to the precarious Fate of former *Hypotheſes*, but will continue as laſting and uſeful as the Obſervations of *Hippocrates*.

Fixed on ſuch a ſure Baſis, our Profeſſion has at length raiſed her drooping Head among other Sciences, and within theſe few Years has received large Improvements from *Borelli*, *Bellini*, *Pitcairn*, *Hygenius*, *Mead*, *Freind*, *Cheyne*, and ſome few beſides: But no one has ſo far advanced its Progreſs as the learned *Boerhaave:* By the Aſſiſtance of a full Knowledge of the antient and modern Diſcoveries, an unwearied Induſtry, and an uncommon Genius, he has already done the greateſt Service to the Art of Phyſic, and ſeems to be moſt capable of bringing it neareſt to perfection. A great Part of the following Account of Nutrition was publiſhed in a *Theſis* ſome Years paſt when I ſtudied Phyſic under him at *Leyden*. A languid conſumptive Habit of Body probably fixed my Attention more particularly to this Subject at that time, and has in ſome Meaſure ſince engaged me to attempt to bring it to a greater Maturity; and I ſhall not think my Labour ill beſtowed, if the Rules laid down prove as ſerviceable to others, as they have been to me. I have endeavoured to imitate (tho' very imperfectly) the Method of Reaſoning which that *great Man* recommends, and with moſt willing Gratitude own my Self indebted to him for ſeveral material Obſervations which I received in his private Courſe of Lectures.

The following Treatiſe is divided into three Parts. The firſt contains an Account of *Nutrition*, the ſecond a Deſcription of the Structure and Uſe of the *Lungs*, and from this preceding Theory I have next endeavoured to explain the various Cauſes and Progreſs of a *Conſumption of the Lungs*, with a Method of Cure deduced from theſe Principles. No rational Account can be given of this Diſeaſe without this regular Method, for a *Conſumption* in general muſt always proceed from a Defect of ſuch Cauſes as conſtitute *Nutrition*; and whoever is unacquainted with the Fabrick and the ſeveral Functions of this great Organ in its natural State and Vigor, will be incapable of underſtanding the Cauſes of its Decay, and the various Effects which are thence produced.

When a juſt Method is laid down, every thing flows eaſily and diſtinctly from it. An affected Obſcurity has been too often miſtaken for deep Learning in Phyſic, and that *Hypotheſis* has gained the greateſt applauſe which was moſt curiouſly wrought; but as its Beauty conſiſted in the elaborate Imitation of the nice Texture of a Cobweb, ſo its Duration was equally uncertain, and precarious. A clear Simplicity is the ſureſt Teſt of Truth, and whoever conſiders the great Uniformity that is to be obſerved in the ſeveral Parts of a human Body, and the ſtrict Analogy that is kept up between the greater and leſſer Parts, will find that the immediate Cauſes of Diſeaſes are more ſimple and plain than they are generally ſuppoſed to be; and that their great Difference and Variety of Symptoms are chiefly owing to their different Situation. How eaſie it is to account for a light *Boil* or Inflammation in the Hand? How few Symptoms are thence produced? But how greatly is the Scene altered if the ſame immediate Cauſe produces ſuch an Inflammation in the *Pleura* or *Lungs*? And its Termination into an *Abſceſs*, which gives Relief in the former Caſe, is in the latter attended with a various Train of Symptoms, and moſt frequently ends in Death. An *Hæmorrhagia Narium* often proceeds from the ſame immediate Cauſe as a fatal Apoplexy. The different Conſequence is owing to their different Situation, for in one the Blood from the ruptured Veſſel has a free Diſcharge, in the other it lodges on, and preſſes the nervous Tubes whoſe free and open Action is neceſſary to continue Life in a human Body. The great Art of a Phyſician conſiſts in forming a juſt Notion of the Cauſe, and Seat of a Diſtemper; and when the Indications of Cure are deduced from ſuch certain and evident Principles, 'tis an eaſy Matter by the Uſe of few and frequently plain Medicines to carry it off. This Aſſertion is not only agreeable to the ſtricteſt Reaſoning, but is confirmed by Experience; ſince the moſt happy Practitioners have been always remarkable for the Simplicity of their *Medicines*, while ſuch who endeavour to explain Diſtempers from complex and immechanical Cauſes, ſuch as *Efferveſcencies*, *Precipitations*, *Alkali's* engaging *Acids*, and uſe as wild a

Farrago of Medicines, are as remarkable for their ill Succeſs.

Nature generally points out a Method of Cure in moſt Diſtempers, for ſuch is the wiſe Contrivance of a human Body, that whenever any Part is oppreſſed and diſordered, the whole *Oeconomy* is engaged in endeavouring to *correct* or *evacuate* whatever is the Cauſe of the Diſeaſe: And the Effects or Symptoms which are thence produced are often to be regarded as natural Remedies, not as an Enemy or Diſeaſe: The great Knowledge of a Phyſician conſiſts in juſtly diſtinguiſhing when ſuch Symptoms are to be ſuppreſſed, and when encouraged; for it is much more eaſy to check any Symptoms, (in which generally the chief Skill of Empirics is employ'd) than rationally to conceive from what natural Motions in the human Syſtem they are produced, and how far they contribute to its Relief or Prejudice. Sometimes the Force of ſuch ſalutary Efforts is too violent or miſguided, in which Caſe it is the Buſineſs of a prudent Phyſician to reſtrain or direct them to another Courſe: Sometimes they are ſo faint and languid, as to prove ineffectual unleſs quickned and invigorated. The great Difficulty conſiſts in a prudent Direction of the Symptoms of a Diſtemper, which if rightly managed, is often beſt conquered by its own Weapons.

The Practice of Phyſic is become too much a Trade. A ſullen Grimace, or an artful Addreſs, with an unintelligible Way of talking ſuited to the common Vogue, often ſupply the Place of true Merit, and gain the Preference. As few are Judges of this Science, 'tis an eaſy Matter by ſuch a Behaviour to gain the Character of a Phyſician, but nothing requires more Skill and Labour than juſtly to deſerve it. Such a one cannot careleſly apply a Receipt to the Name of a Diſeaſe, but from a ſufficient Knowledge of the Structure of a human Body, the Uſe of the ſeveral Parts, and from an exact Hiſtory of the natural Progreſs of Diſeaſes, endeavours to deduce a right Method of Cure ſuited to the various Exigencies, and Conſtitution of the Patient.

A
TREATISE
ON A
CONSUMPTION
OF THE
LUNGS.

PART the I.

Of *Nutrition.*

A *Human Body* being compoſed of almoſt an infinite Number of *Veſſels*, and *Fluids* circulating thro' them, is from this very Condition of its Frame, ſubject to a conſtant Decay;

ſician to reſtrain or direct them to another Courſe: Sometimes they are ſo faint and languid, as to prove ineffectual unleſs quickned and invigorated. The great Difficulty conſiſts in a prudent Direction of the Symptoms of a Diſtemper, which if rightly managed, is often beſt conquered by its own Weapons.

The Practice of Phyſic is become too much a Trade. A ſullen Grimace, or an artful Addreſs, with an unintelligible Way of talking ſuited to the common Vogue, often ſupply the Place of true Merit, and gain the Preference. As few are Judges of this Science, 'tis an eaſy Matter by ſuch a Behaviour to gain the Character of a Phyſician, but nothing requires more Skill and Labour than juſtly to deſerve it. Such a one cannot careleſly apply a Receipt to the Name of a Diſeaſe, but from a ſufficient Knowledge of the Structure of a human Body, the Uſe of the ſeveral Parts, and from an exact Hiſtory of the natural Progreſs of Diſeaſes, endeavours to deduce a right Method of Cure ſuited to the various Exigencies, and Conſtitution of the Patient.

A TREATISE ON A CONSUMPTION OF THE *LUNGS.*

PART the I.

Of *Nutrition.*

A *Human Body* being compoſed of almoſt an infinite Number of *Veſſels*, and *Fluids* circulating thro' them, is from this very Condition of its Frame, ſubject to a conſtant Decay;

for ſince *Attrition* is the unavoidable Effect of Motion, by which the ſtrongeſt Bodies are at length deſtroyed, it is impoſſible but that *Veſſels* of ſuch a tender Fabric, if not conſtantly repair'd, muſt be quickly abraded by a perpetual *Circulation.*

No ſingle Part has a conſtant Duration, even the moſt Solid is not exempt from this common Fate, but, like the reſt, ſucceſſively periſhes and is reſtored: It has been found by repeated Obſervations, that all the *Hair* in the Body is renewed twice in a Year, the *Nails* every two Months; and even the *Thigh-Bone* if broken, will reunite by emitting *Fibres*, which acquire an equal Solidity with the reſt in the ſpace of ſixty Days: The ſurface of the Body, tho' ever ſo cautiouſly preſerved, gives a quick Tincture to whatever is apply'd to it, which examined with the beſt Microſcopes, (*a*) appears to be compoſed of the ſeveral conſtituent Parts of the *Solids* and *Fluids*, which conſtantly exhale and periſh.

(*a*) *Leuwenhoek Tom.* 4. *Epiſt.* 43. *p.* 407.

The continual *Abraſions* of the *ſolid Parts*, and the Loſſes which the *Fluids* ſuſtain in reſpect of their *Quantity*, require a conſtant Repair, which is likewiſe made more neceſſary on this Account, that the *Quality* of the *Fluids* is ſo far altered, by being chiefly deprived of their *ſofteſt* and *moſt diluted Particles*, and by being agitated by repeated *Circulations*, that inſtead of continuing as fit for *Nouriſhment* as before, they at length become deſtructive, and acquire the Nature of a *mineral Poyſon*, whoſe *Malignity* conſiſts in the *Gravity* and *Acrimony* of its *Particles*; for whatever is taken for *Nouriſhment* ſhould be *ſpecifically* lighter than the *Blood*, and the *Chyle* and *Milk* made from thence are ſtill lighter, for, as (*a*) *Lower* obſerved, they float on the ſurface of the *Blood*; therefore the *Denſity* of the *Fluids*, depends not on the *Nature* of them, but on the compreſſing Force of the *Veſſels*, and the longer they receive this Action without the

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(*a*) *De Chylo ejuſq; in ſanguinem tranſitu et tranſmutatione.*

Addition of freſh *diluting Particles*, the more *compact* and *heavy* they become; and as the *Attrition* and *Heat* of the *Fluids* increaſe in Proportion to their *Denſity* and *Velocity*, the *Saline* and *Oily Particles* become thereby greatly *exalted*, and acquire ſuch a degree of *Acrimony*, as muſt unavoidably in a ſhort Time deſtroy the Body.

The Truth of this Reaſoning is confirmed by the following *Experiment*. If the Humours of a healthy Man are received in a Veſſel, and agitated with a Degree of Heat equal to that which is natural to a human Body, they in the Space of ſix Days become entirely *putrid*, and in three Days acquire a very pungent *Acrimony*; from whence it is evident, that the *circulating Fluids*, from the ſame Cauſes, receiving ſuch a Diſpoſition, (tho' a longer ſpace of Time is in this Caſe required) muſt quickly irritate, and deſtroy the tender *Veſſels* of the Brain; and on this Account ſuch as periſh with Hunger, are generally ſeized with a raving Madneſs before they die.

That Health therefore ſhould be preſerved in a human Body, it is neceſſary that the *Quantity*, and *Quality* of what is reſtored to the *Solids*, and *Fluids*, ſhould be exactly proportioned to the Strength of the *Conſtitution*, and the *Loſſes* ſuſtained by the *Actions of Life*; if the *Quantity* of *Nouriſhment* be increaſed, tho' turned into good digeſted *Humours*, the *Body* becomes *Plethorick*, and into bad, indigeſted, and not rightly aſſimilated *Juices*, the *Body* becomes *Cachectick*; if the *Quantity* of *Nouriſhment* be diminiſhed an *Atrophy* ſucceeds; if its *Quality* be altered and a Vitiated *Humour* is received into the *Veſſels* a *Cacochymy* is thereby produced: This proportionate Reſtoration of the *Solids*, and *Fluids*, is what conſtitutes *Nutrition*, which as widely differs from *Repletion*, as Water poured on the Root of a Tree, differs from the laſt elaborate Juice from whence the Fruit is produced.

Having thus made evident the abſolute Neceſſity of a conſtant *Repair* of the *Solids* and *Fluids*, I ſhall now endeavour to trace our *Food* from the firſt *Paſſages*, to the laſt; and to explain the different Changes it undergoes, 'till it is fit to become *Nouriſhment*, and farther to deſcribe the *Manner* how it is performed.

All our *Humours* are produced from what we eat and drink, and all our *Solids* are compoſed of theſe *Humours*; (*a*) there are no *Vegetables* whatever (except they be of a poyſonous Nature) but what with plain Water will afford ſufficient *Nouriſhment* to Perſons accuſtomed to them; and daily Experience convinces us, that the Reverſe of ſuch a Diet, the greateſt Luxury of Food, cannot prevent others from being ſufficiently nouriſhed; a human Body being a Machine ſo admirably contrived, that it can aſſimilate the greateſt Variety of Humours, and reduce them to a Temper like its own.

The Food taken for Nouriſhment, before it is received into the *Stomach*, is greatly prepared by *Maſtication*, which breaks, and reduces it into ſmall-

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(*a*) *Tulp. Obſ.* IV. 19.

er Parts, and mixes it with the *Mucus* of the Mouth, and the *Salival Juice*, whoſe great Uſefulneſs may be eaſily underſtood from its Origine, (being ſeparated from the pureſt *Arterial Blood*,) and from the good Effects it produces by being frequently ſwallowed; for by that Means it greatly contributes to promote *Digeſtion*, and as by repeated *Cohobations* riſes purer, and more fit for *attenuating* and *diluting* the *Aliment*; whereas ſuch who careleſsly diſcharge, by ſpitting, this uſeful Humour, are moſt commonly ſubject to *Indigeſtion*, and an ill *Habit of Body*.

The Action of the *Muſcles* compreſſing the Food, in *Maſtication*, is ſo ſtrong, that (*a*) *Borellus* has computed their united Force to exceed 1350 Pounds; and to make it more effectual, the Mouth is furniſhed with ſeveral Teeth, to cut, and grind the Food, with a Form variouſly ſuited to theſe Purpoſes, ſome ſharp, others whoſe Surface is more large, with proper Emi-

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(*a*) *De motu Animalium. Propoſ.* 88. Tab. IX. Fig. 2.

nences, where, when the Food is determined, by the ſucceſſive Motion of theſe *Muſcles*, it receives a more powerful *Attrition* and *Comminution.*

From hence may be explained the Obſervation of (*a*) *Hippocrates*, *Longævi plures dentes habent.* The Food in ſuch Perſons being generally well prepared; whereas ſuch who have bad, or few Teeth, are from an imperfect *Maſtication* more ſubject to indigeſted *Crudities*, *Obſtructions* of the *Viſcera*, with their fatal Conſequences.

The Food thus prepared by *Maſtication*, and received into the *Stomach*, is there farther altered, and digeſted by the heat of the *Stomach*, the mixture of the *Juices* ſeparated, or contained in it, the Mechanic action of its *Fibres*, and the compreſſive Force of the circumambient *Parts.*

The external Coat of the *Stomach*, on its *convex* Side, conſiſts of a great Number of *Veſſels*, on its *concave* ſide of longitudinal *Fibres* (which when

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(*a*) Οἱ μακρόβιοι πλείους ὀδόντας ἔχουσιν. Lib. 2. Sect. VI. Epid.

contracted, diminiſh its Length) next to this Coat lies that deſcribed by (*a*) *Ruyſch*, which ſupplies the *Carnous Coat* immediately under it, with a *lubricating* Moiſture, that makes it more eaſily capable of Motion. The *convex* Surface of this *muſcular Coat*, conſiſts of a *Series* of *orbicular Fibres*, which encompaſs the *Stomach*, after a *Spiral* manner, from the *upper Orifice* to the *Pylorus*; (and by their action diminiſh the Breadth of the *Stomach*) the *concave* Part conſiſts likewiſe of two *Orders of* Fibres, the firſt oblique, which contract the Bottom of the *Stomach* obliquely towards its back Part, and by that Means diminiſh its Length; the ſecond *Order* are much longer than the reſt, and lye *Parallel* to the Length of the *Stomach*, embrace the whole *Pylorus*, and uniting at the back Part thereof, encircle its *upper Orifice*: the internal Coat of the *Stomach* is much longer than any other, but contained in the ſame Space, on which Account its *concave* Side riſes into Furrows, and its Surface is likewiſe made more un-

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(*a*) *Theſ.* 2. Tab. V. Fig. IV.

equal, by ſeveral Glands which lye on its *convex* Side, and terminate in its Cavity, from whence a *mucilaginous Humour* is ſeparated, which lubricates the *Stomach*, defends it from the *Acrimony* of the Food, and prevents it from adhering to its Sides. Several *arterial* Branches likewiſe terminate there, which perpetually exhale a thin diluting Fluid not unlike the *Saliva*. In the internal Cavity there are two remarkable *Sinus's*, one at the *upper Orifice*, the other under the *Pylorus* which is largeſt, and by that Means the Food when propelled there, is prevented from paſſing off unprepared by its own Gravity.

The Heat of the *Stomach* in a healthy Man, is greater than the common Heat of the *Sun* in a Summer's Day; and as it appears by *Experiments* is more eaſily ſuited for the *Digeſtion*, and *Diſſolution* of *Bodies*, than a much greater *Heat*; which by carrying off the finer *Particles*, frequently *fixes* and *coagulates* what by a milder *Heat* would be *attenuated* and *reſolved*: From hence it is evident, that if the *Stomach* be conſidered only as an inactive *chymical Veſſel*, agitated with ſuch a Degree of *Heat*, the *Aliment* received into it, *diluted*, and *mixed* with the *Humours* ſeparated, and contained there, will be from thence greatly *attenuated*, and *reduced* into a more *ſoft* and *fluid Subſtance.*

The *Comminution* of the *Food* is likewiſe greatly aſſiſted by the *Air*, which is intimately mixed with it, whoſe *expanſive Force*, when retained in a cloſe warm Place, increaſes in Proportion to its *Heat*, and the *Preſſure* on it; both which are in the *Stomach* very conſiderable, and by the *reciprocal Motion* of the *Diaphragm*, and of the *Muſcles* of the *Abdomen* perpetually varied; by which Means the *inteſtine Force* of the *Air* mixed with the *Food*, is from thence, ſucceſſively *expanded*, and *contracted*, and more powerfully contributes to a greater *Comminution* of it, than one continued *Preſſure*, though of much ſtronger *Force.*

Hence appears the Reaſon why ſome time after a *full Meal*, (from this increaſed *Expanſion* of the *Air*) the *Stomach* ſeems more filled, and oppreſſed, than immediately after it is finiſhed.

The internal Coat of the *Stomach*, by being *rugoſe*, gives a neceſſary Delay to the *Aliment*, that it may not eaſily paſs off *indigeſted*, but receive for a longer time the Action of the *Stomach*, which is likewiſe by this *Structure* prevented from being at any time entirely empty, ſome Remains of the former Meal being always retained between its *riſing Furrows*, and being thence rendered very *active* and *acrimonious*, conſtitutes with the *ſalival Juice*, which is perpetually ſwallowed, a true *Ferment*, that moſt commonly promotes a *Fermentation* of the next *Food*, and in ſome Meaſure contributes to Digeſtion, by giving a greater *Attenuation* to the *Aliment* thus agitated: But ſuch a *Fermentation*, though often begun in the *Stomach*, is never perfected there from the Want of ſufficient *Reſt* and *Time*; for that a *Fermentation* ſhould be finiſhed, it is neceſſary that the *fermenting Bodies* ſhould remain undiſturb'd in the ſame *Veſſel*,

Veſſel, till their *inteſtine Motion* gradually ceaſes, which is prevented by the *muſcular Fabric* of the *Stomach*, which produces a farther Alteration in the *Aliment*, and perpetually expels the finer Parts through the *Pylorus*.

When the *muſcular Fibres* of the *Stomach* are contracted, its Capacity in *Breadth* and *Length* is diminiſhed, the *Orifices* become more *cloſed* and *contracted*, the *Wrinkles* in the internal Coat approach nearer to a mutual Contact, by which Means the contained *Food* receives from every Part a great *Preſſure* and *Attrition*, which powerfully contribute to attenuate, and reduce it into finer Parts. The Force of this *muſcular Action* on the Food contained in the *Stomach* is very conſiderable, and with the concurring Force of the *Diaphragm*, and of the Muſcles of the *Abdomen*, has been computed by (*a*) *Pitcairn*, and ſome others, to be equal to a Weight of 117088 Pounds, which appears

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(*a*) *Diſſertatio de motu quo cibi in ventriculo rediguntur ad formam ſanguini reficiendo idoneam, et Epiſtola ad* Pitcarnium *quâ reſpondetur libello Aſtrucii.*

appears to be incredible, and not juſtly calculated.

The Force of this muſcular Motion (*cæteris paribus*) increaſes in Proportion to the *Quantity*, and *Acrimony*, of whatever is received into the *Stomach*; on this Account, when it is too much diſtended by Debauches, it becomes moſt incapable of diſcharging its *Contents*, the *Fibres* being thereby irritated to a greater *Contraction*, which is always more particularly ſtrong at the *Orifices*, than in any other *Parts*, the *Fibres* being there more cloſely collected, and compacted: Hence the greateſt Anxiety often ſucceeds from too great a Debauch, (the *Stomach* from the ſtrong Contraction of the *Orifices* being incapable of diſcharging the oppreſſing Load,) and continues, till at length the *diſtending Preſſure* is ſo great, as to overcome the *Reſiſtance* of either *Orifice*; by which Means it generally terminates in a *Diarrhœa*, or a *Vomiting*, but moſt commonly in the latter, the *Fibres* at the upper *Orifice* being more yielding, and leſs compacted.

When the *Stomach* is moſt contracted, either by the natural Force of its *Fibres*, or by being irritated by the ſtrongeſt *Emetics* (as *Monſieur Chirac* and *Pyerus* have by Experiments demonſtrated) its Capacity is never ſo far diminiſhed, as to bring its oppoſite Sides to a Contact; (which was the Opinion of *Pitcairn* and ſome others) therefore the mechanic Action of the *Stomach*, preſſes only on that Exceſs of *Food*, which is ſufficient to diſtend it beyond its greateſt Contraction: Thus if the *Stomach* when moſt contracted, can retain ſix Ounces of *liquid Food*, then if twelve are received, it can only exert its preſſing Force on the ſix Ounces, which will nevertheleſs be thereby in a great Meaſure communicated to the other Six.

The *orbicular Fibres* chiefly contribute to give to the *Stomach* its *Periſtaltic Motion*, which is not equal in every Part, but ſucceſſive, beginning at the upper *Orifice* and alternately continued to the *Pylorus*: From this varied *Contraction*, and *Relaxation*, the

Food receives a more exquiſite *Comminution*, than from a continued Preſſure; and is thence likewiſe determined to the *Pylorus*, through whoſe contracted Orifice the finer Parts ouze out into the *Duodenum*, and the groſſer remain in the *Stomach*, 'till by a longer Repetition of the ſame Actions, they are ſo far attenuated as to be capable of paſſing off the ſame Way: When the *Stomach* is ſo far emptied as not to be diſtended beyond its natural Tone, the *Pylorus* becomes ſo open and flaccid, as to give an eaſy Paſſage to the *Food*, which is thence expelled by the *periſtaltic Motion* of the *Stomach*, and the compreſſive Force of the circumambient Parts.

We are to obſerve farther, beſides the Alteration, which the Food receives from the immediate Heat, and mechanic Action of the *Stomach*, it is moſt conveniently ſituated between the largeſt and moſt warm *Bowels* in the *Body*, to receive the greateſt Advantages of *Heat*, and *Preſſure*; on its right Side the *Liver* is placed, whoſe *Heat*, from the great Quantity of *Blood* circulating through its *Veſſels*, is very conſiderable; on the left Side lies the *Spleen*, the *Pancreas* under it, the *Diaphragm* above it, by whoſe Heat and Motion it is warmed, and agitated; before it is placed the *Peritoneum*, which by the ſucceſſive Action of the *Muſcles* of the *Abdomen*, gives a Motion to the *Stomach*, oppoſite to that which it receives from the *Diaphragm*, ſo that it lies as in a Preſs between them; behind it is placed the *Aorta*, the largeſt Veſſel in the Body, whoſe Heat and conſtant Vibrations are very conſiderable. Whoever juſtly conſiders theſe powerful concurring Cauſes, will find them ſufficient to account for all the Changes which the Food receives in the *Stomach*; for its Action is very different from what it is generally deſcribed to be, and is not capable of diſſolving the ſolid Parts of *animal* or *vegetable Bodies*, but only conſiſts in attenuating and expreſſing their fluid Parts. This is confirmed by repeated and obvious *Experiments*, for *Currants*, *Grapes*, or any other *Fruit*, or *Seed*, ſwallowed whole and entire, without chewing, remain ſo in the *Excrement*. From whence the Reaſon plainly appears why the *Stomach* it ſelf is not diſſolved by its own Action, of which it muſt certainly be in great Danger, were it formed ſo tender and ſoluble, and contained an active *Ferment*, or could it excite ſuch a powerful *Attrition*, as might be capable of diſſolving or grinding the ſolid Parts of ſuch *Food* as is often received into it, and which have as ſtrong a *Coheſion* as the Subſtance of the *Stomach* it ſelf.

It is certain that there are ſome *Animals*, whoſe *Stomachs* are ſo hard and callous, and the mutual *Attrition* of its Sides ſo ſtrong, as to be alone capable of reducing and grinding ſolid *Food*; but *Digeſtion* in a human *Body* is performed after a very different Manner; neither are *Dogs* capable of diſſolving any ſolid *Food*, or reducing *Bones* (as the common Notion prevails) into a white *Excrement* by the Action of their *Stomach*; for if they are given to them involved in any Morſel, and ſwallowed whole, they will be diſcharged unaltered with their *Excrement*: The white Colour which is often obſerved in the *Excrement* of *Dogs*, and which is in ſome Meaſure the Cauſe of this Error, is only to be ſeen when they have firſt gnawed the *Bones*, and reduced them into ſmall Parts before they have been ſwallowed.

Moſt Authors that have endeavoured to account for the *Digeſtion* of the *Food* in the *Stomach*, have been ſo fond of ſome particular *Hypotheſis*, as to reject the Opinion of others, which tho' not entirely, has been perhaps partly true: Thus the *Galeniſts* have aſcribed the Cauſe of *Digeſtion* to the *Heat* of the *Stomach*; the *Chymiſts* to a *diſſolving Ferment*, and others to the *mechanick Action* of its *Fibres*, and of the circumambient Parts: Whereas neither of theſe Cauſes is alone ſufficient, but all in ſome Meaſure concur to produce that Alteration, which the *Food* receives.

Baſilius Valentinus was the firſt among the *Chymiſts*, that ſuppoſed *Digeſtion* was owing to an acid diſſolving *Menſtruum*: *Paracelſus* received this Opinion from him; *Van Helmont* carried it farther, and aſſerted that the *Spleen* prepared this *Menſtruum*, which was from thence conveyed into the *Stomach* by the *Vaſa brevia.* *Sylvius* rav'd of his *Duumvirate*, and carried the *Colluctations* excited in the *Duodenum* from a Mixture of an *acid pancreatic Juice* and an *alkaline Bile* into the Blood, and endeavoured to account not only for *Digeſtion*, but for moſt Diſeaſes and their Method of Cure, either from theſe *Efferveſencies* being too *intenſe*, or too *languid*: Theſe Notions prevailed for a long Time, and produced fatal Errors, 'till they were at length exploded by greater Improvements in *Anatomy*, and *Chymiſtry*. *Lower* has moſt accurately deſcribed the Courſe of the *Veſſels* diſtributed through the *chylopoietic Bowels*, and has ſhewn that the *Vaſa brevia* receive a Humour from the *Stomach*, but convey none to it: And from the moſt exact Experiments it appears, that no *Acid* or *Alkaline Humour* is either ſeparated in the *Stomach*, or in any other Part of the *Body*; neither are ſuch *Efferveſcencies* thence excited either in the firſt Paſſages, or in the Blood. Whatever *Acid* is contained in the *Stomach*, proceeds from the Remains of the former *Food*, and tho' it frequently contributes to promote *Digeſtion*, yet it is by no Means abſolutely neceſſary to it; and we find by Experience that *Elix: propriet. Tart.* and *Aromatic bitters*, which contain a *Volatile Salt*, and are of a Nature oppoſite to that of *Acids*, are often with Succeſs given to create an *Appetite*, and mend a bad *Digeſtion*: And it is farther obſervable, that the *Humours* which are contained in the *Stomach* of the moſt rapacious *Birds*, and *Beaſts of Prey*, have never an *Acid* but a *Saline* Taſte.

The *Aliment* thus prepared in the *Stomach*, and expelled into the *Inteſtines*, is farther *attenuated*, and *propelled* into the *Lacteals*, by the contracting

Force of the *Inteſtines*, and the compreſſive Motion of the circumambient Parts; and (from every Place it paſſes through, from the time it is received into the Mouth, 'till it enters the *Subclavian Vein*,) is perpetually diluted by the Mixture of the natural prepared *Humours* of the *Body*; ſo that the leaſt Part of that *Chyle* which enters the Blood, is compoſed of the Food taken for Nouriſhment: The Food is mixed with a mucilaginous Humour, and the *Saliva*, in the Mouth; In the *Oeſophagus*, and *Stomach*, with Humours much of the ſame Nature; In the *Duodenum* with the *Pancreatic Juice*, and the *Bile*, which laſt, is the moſt elaborate *Humour* in the Body, having twice circulated through the laſt Extremities of the *Arteries*, and thence acquired ſuch a *Saponaceous* Activity, as chiefly contributes to attenuate the *Viſcidity* of the *Chyle*, and to give it an uniform Conſiſtence; In the other *Inteſtines* it is mixed with a thin Juice exhaling from the Arteries, and a mucilaginous humour ſeparated from the

Glands deſcribed by (*a*) *Peyerus*: In the *Meſentery* paſſing through the *Lacteals*, and in the *Thoracic Duct*, 'tis perpetually diluted with a great Quantity of *Lympha*; for as the *Vena cava* receives all the returning Blood, ſo the *Thoracic Duct*, receives all the returning *Lymphatic* Juices of the *Body*, and may as well deſerve the Name of *Vena Cava Lymphatica* as of *Ductus Chyliferus*.

Beſides the Cauſes already mentioned, it is probable that the Chyle is impregnated in the *Stomach*, and *Inteſtines*, with a great quantity of *Animal Spirits*; for there is an uncommon Diſtribution of *Nerves* to theſe Parts, and much greater than ſeems ſufficient for their *muſcular Motion*, and it is more than probable, that the laſt Extremities of the *Nerves*, terminate in ſeveral Parts of the *Body*, where they are diſperſed, and perpetually exhale that elaborated Fluid. Hence appears the Reaſon why ſuch as have a bad Habit of Body, receive but an imper-

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(*a*) *Parerga Anatomica, Exercit.* 1*a*.

fect Nouriſhment from the moſt *concocted*, and beſt *prepared Aliment*; the *Chyle* made from thence being ſoon tinctured, and depraved by the natural *Juices*, which are mixed with it: And why ſuch, who have faſted for a long time, or have recovered from acute Diſtempers, if they take ſuddenly too great a quantity of Nouriſhment, are apt to fall into *Obſtructions*, and particularly of the *Meſentery*; their *Fluids* being exhauſted to ſuch a Degree, as not to ſupply a ſufficient Quantity to dilute and prepare the Chyle.

From this Account of *Digeſtion*, may be evidently explained the Cauſes which naturally excite, or deprave the Appetite, and what artificial Stomachics are proper to reſtore it, together with their Manner of Operation.

Hunger is produced by an uneaſie Irritation of the *nervous Coats* of the *Stomach*: This Senſation is particularly excited when the *Stomach* is moſt empty, either by the *Attrition* of the *Rugæ*, which then approach more cloſely to a mutual Contact, or by the *Acrimony* of the *Humours*, which are ſeparated, or contained in the *Stomach*.

This *Acrimony* ~~has~~ a various Origine, it is either ſeparated from the *Glands*, and exhaling *Arteries* in the *Stomach*, and is then of a *Saline Nature*, (on which Account *Scorbutic* Perſons are moſt commonly remarkable for having a great Appetite) or proceeds from the *acid* Remains of the former Meal, or from a Regurgitation of the *bilious Juice*, which when the *Stomach* is empty has an eaſie Admittance into the flaccid *Pylorus*; on this Account likewiſe Perſons of an *Atrabiliarious* Conſtitution, in whom the *bilious Humour* is very active, and pungent, have frequently the moſt voracious *Appetite*, which ſometimes is apt to produce Dangerous Effects, and to terminate in a *Fames Canina*.

The Want of an *Appetite*, is owing to the reverſe of ſuch Cauſes as naturally excite Hunger; and therefore proceeds either from a *Relaxation* of the *Stomach*, or from a Fault in the *Humours ſeparated* or *received* into it.

The *Humours* contained, or ſeparated in the *Stomach*, deprave the *Appetite*, when either from the Oppreſſion of a viſcous *Phlegm*, or from a pungent *Acrimony*, they afford a painful, or a diſagreeable Senſation to the *nervous Coat* of the *Stomach*; thus although *acid* and *bilious Humours*, when contained in the *Stomach* not vitiated, and in a proper Quantity, contribute to excite an *Appetite* by giving an agreeable, tho' an uneaſie Senſation; yet when their *Acrimony* is depraved, or too great, or the *Coats* of the *Stomach* too tender, the Irritation thence produced, by being increaſed, becomes painful; for the Cauſes of *Pleaſure*, and *Pain*, differ only in a ſmall degree, and all Pleaſure is attended with a *Stimulus*, which is ſo far uneaſie, as ſtrongly to prompt Perſons ſo affected to deſtroy it, and when increaſed, and afterwards gratify'd, it terminates either in Indolence, or Pain. On this Account, the greateſt *Appetite* which is excited from long Faſting, turns at length to a nauſeous Abhorrence of all *Food*, the

Humours having thence acquired an exalted putrid *Acrimony*, which affords a painful and diſagreeable Senſation.

When the Want of an *Appetite* is owing to a *Relaxation* of the *Fibres*, ſuch *Stomachics* are required, which by their *Aſtringency* can brace them up, and bring the *Rugæ* more cloſely to a mutual Contact, and Attrition, and by being moderately *warm*, increaſe the Contraction of the *muſcular Coats*, by encouraging a greater Influx of Animal Spirits.

The Cauſes which by *vitiating the Humours*, give a diſagreeable Senſation to the *Stomach*, are various; ſuch as *nervous Spaſms*, *Indigeſtion*, from a Relaxation of the *Stomach*, an *irregular Diet*, or a *particular bad Habit of Body:* when the *Stomach* is thus affected, *Emetics*, or *Stomachic Purgatives* muſt be firſt uſed, to diſcharge the *viſcid Humours*, or the uneaſie *Stimulus*, and then ſuch *Medicines* as are particularly appropriated to the firſt Cauſe of the Diſorder: Thus for Inſtance *Aſſa fœtida* may prove a *Stomachic* to ſome, which in others would excite a *Nau-*

ſea; *cooling Acids* are proper to quicken the Appetite of ſuch, whoſe *Humours* are too hot, and inclined to *Putrefaction*; *Elix. propriet. Tart. Sal Abſynth*: which are of a reverſe Nature, are moſt ſuitable to ſuch, whoſe *Stomachs* abound with cold, ungrateful, *acid Humours.*

Pungent, *ſtimulating Stomachics*, ought never to be given when the *Appetite*, and *Digeſtion* are depraved, without being joyned with ſuch *Medicines*, as ſtrengthen the *Stomach*, and help *Digeſtion*; for they only afford a falſe deſtructive *Appetite*, and are ſoon blunted and abſorbed by the Food which is taken; while the *Stomach* by its languid Heat, and Motion, and that of the circumambient Parts, is incapable of *Digeſting* it: By this Means Crudities are collected, Obſtructions of the *Viſcera* are from thence formed, and what was deſigned for Nouriſhment, proves at length a moſt certain Deſtruction to the Body: on this Account the Cuſtom of *Whetting* in a Morning, has been ſo frequently obſerved to be attended with a fatal Conſequence.

In ſome Conſtitutions where there is an univerſal *Relaxation* of the *Fibres*, and particularly of the *Stomach*, the *Nerves* are ſo ſenſible, and tender, as to be eaſily irritated, and quickned by the Uſe of *pungent Stomachics* : But when the *Stomach*, by frequent *Debauches*, has been greatly diſtended, the *Fibres* are thence apt to loſe their Tone, and to become *Paralytic*, and inſenſible of the ſtrongeſt *Irritations*, which *Stimulating Medicines* can excite : in ſuch a complicated Caſe, *Aſtringent*, *Warm*, *Pungent Stomachics* are required, which may brace the *Fibres*, and by their Heat encourage ſuch an Afflux of *Animal Spirits* to them as may make them ſenſible of the *Stimulus*, the Force of which would be otherwiſe eluded: ſuch a Method will prevail, (if the Diſorder be not ſo far advanced as to admit of no Relief) eſpecially if joyned with *Temperance*, which gives the diſtended Parts Liberty to recover their Tone, and with *Exerciſe*, which is the moſt excellent *Stomachic*, and *Digeſtive*, as it powerfully contributes to promote the *Contraction* of the *Stomach*, and thence the *Attrition* of its *Rugæ*, by encouraging a greater Influx of *Animal Spirits* into its *muſcular Fibres*, and by increaſing the compreſſive Force of the circumambient Parts.

The Time which is neceſſary for the *Digeſtion* of the *Aliment* in the firſt Paſſages, is varied according to the Nature of the *Food*, and the particular Strength of the *Conſtitution*: Liquids ſoon paſs into the *Blood*, and the more ſolid the *Food* is, the longer Time is required: (*a*) *Waleus* from ſeveral Experiments concludes, that common ſolid *Food* in a healthy Man, is in the Space of ſix Hours entirely diſcharged out of the *Stomach*, changed into laudable *Chyle*, and begins to flow into the Blood, and (*b*) *Lower*, aſſiſted by his Experiments, ſhews that in two Hours more, this *Chyle* is changed into *Milk*, and circulates through the *Veſſels* in that Form; and in two Hours more by the repeated Force of the

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(*a*) *Epiſtola* 1. *a. ad Barthol. de motu Chyli et Sanguinis.*

(*b*) *De Sanguinis Motu et Colore.*

Veſſels acting on it, but particularly of the *Lungs*, is changed into *Serum* which is that *animal Fluid* that contains all the Materials required for Nouriſhment.

Thus the *Lungs* are chiefly inſtrumental in preparing the *Chyle* fit for Nouriſhment, and finiſhing the ſecond *Digeſtion* of the *Aliment*; for the compreſſing Force of its *Veſſels* being particularly increaſed by the *Weight of the Air*, contributes to give a greater *Attenuation*, and *Compaction* to the *Humours* contained in them, than in any other *Veſſels* of the Body; and by the ſame *Preſſure of Air*, the *Form* of theſe *Veſſels* is likewiſe ſo altered, that the unprepared *chylous Humours*, (which would otherwiſe be too groſs to enter the minute *Veſſels*, which are at length to be nouriſhed by them) are obliged to circulate in the *pulmonary Veſſels*, through *Paſſages* as narrow as the moſt minute *Capillaries* of the *Body*; for the (*a*) *Diameter* of a *ſanguiferous Ar-*

(*a*) Leuwenhoek *Tom.* 2. *pag.* 204. *Tom.* 3. *Epiſt.* 28. *p.* 219.

tery in the *Lungs*, before it terminates in a *Vein*, is ſo ſmall, as ſcarce to admit one *Globule of Blood* to paſs through it without being compreſſed into an *oval Form*; but by the Force of the Air inſpired, this Canal is from a *circular*, changed into an *elliptical* Figure, by which Means the *circulating Fluid* is obliged to move through Paſſages which are by ſuch an Alteration rendered much more narrow than before, ſince the *Diameter* of a Veſſel decreaſes in Proportion as it recedes from a *circular Form:* Theſe *ſanguiferous Arteries* likewiſe in the *Lungs* (as in all other Parts of the *Body*) end in *Arteries* which convey *Serum*, and theſe into more minute which convey a *Lympha*; and ſince by the ſame Preſſure of Air inſpired, theſe minute *circular Canals* muſt be made almoſt infinitely leſs, by being forced nearer to a *plane* Figure; it from thence evidently follows, that whatever *Fluid* can circulate through them, muſt certainly be ſufficiently prepared, and capable of entering the ſmalleſt *Veſſels* in the Body.

By the Aſſiſtance of theſe ſeveral concurring Cauſes, the *Food* is changed into *Serum*, which however variouſly examined, ſhews not the leaſt Tincture of *Acid*, or *Alkali*, but is of a mild, ſoft, glutinous Diſpoſition, eaſily mixes with Water, and is almoſt free from either Taſte or Scent; if warmed with a gentle *Heat*, it gradually diſſolves away, and loſes all its *Viſcidity*, but if expoſed to a Degree of *Heat* greater than that which is natural to a Human *Body*, it becomes *coagulated*, and ſo ſolid that it ſtrongly reſiſts the Knife; *Spirit of Wine* mixed with it, produces the ſame Alteration, with this Difference, that it continues then free from *Putrefaction*.

Hence appears the Cauſe of the Blood's *Viſcidity* in all *inflammatory* Caſes, proceeding from an increaſed Degree of *Heat*; the *Blood* in the Beginning of ſuch Diſtempers being often perfectly *florid*, and mixed with a due Proportion of *Serum*: Hence likewiſe appears the great Error, of endeavouring to *attenuate* ſuch *Blood*, by *ſtimulating*, *volatile*, *alkaline* Medicines, and *Bliſters*, which by increaſing the *Motion*, and *Heat* of the *Blood*, muſt conſequently increaſe its *Viſcidity*. This Error is in ſome Meaſure owing to aſcribing the common Properties of a *Homogeneous* Fluid in general to the *Blood*, and the Alterations it receives from *Mechanic Cauſes* acting on it, whereas it is *Heterogeneous*, and endued with Properties only peculiar to this *Fluid*. It acquires a *Viſcidity*, though of a very different Nature, either from too intenſe *Motion*, and *Heat*; or from a *Circulation* too languid; in this laſt Caſe the *Globules* of the *Humours* receive larger *Superficies*, and become *ſpecifically lighter*; in the former Caſe their *ſpecific Gravity* is increaſed, and they are ſo compacted, and preſſed together, that they almoſt become ſolid and unfit for longer *Motion*: The Want of this Diſtinction has been the Cauſe of great Errors in Practice; for the Method of Altering each *Viſcidity* is very different, and the Reaſon which is commonly given for the Uſe of *ſti-*

mulating, *volatile* Medicines, in an *inflammatory Coagulation* of the *Humours*, (that when *Blood* is taken out of the *Body*, and mixed with them, it does not receive ſuch a ſtrong, and quick *Coagulation* as otherwiſe) is the ſtrongeſt Argument that can be offered againſt the Uſe of them; for then it is moſt evident, that the *Viſcidity* of the *Blood* is intirely owing to the *Want* of ſufficient *Motion*, as it is likewiſe in a *Leucophlegmatia*, a particular ſort of *Fever*, and ſeveral *Chronical* Diſorders, where ſuch a *Method* is greatly Serviceable; but the Diſparity is very great, when the *Viſcidity* of the *Blood* proceeds from *too intenſe Heat*, and *Motion*, and which muſt be unavoidably increaſed by ſuch active Preparations.

Hence likewiſe appears the Error of ſuch who aſſert, that *ſpirituous Liquors* attenuate the *Blood*; and likewiſe the Reaſon why ſuch who are too much addicted to them, are ſubject to *Obſtructions*, *Polypus's*, *Palpitations of the Heart*, and *nervous Contractions*.

This coagulated *Serum*, diſtilled from a *Retort*, placed in a *Sand-Heat*, by a Fire of the firſt Degree, affords a *Spirit* of a pale yellow Colour, impregnated with a great Quantity of *Volatile Salt*; the Fire increaſed to the ſecond Degree, raiſes a *Volatile*, *Alkaline Spirit*, with a tranſparent, light *Oil*, of a golden Colour, and a fetid Smell: The laſt Force of the Fire raiſes a black, thick, fetid *Oil*; in the Bottom of the *Retort* remains the *Caput Mortuum*, a black Earth, light, and ſpongy, which *calcined* in an open Fire, becomes white, and inſipid; but cannot receive any farther Alteration, tho' expoſed to the moſt violent Degree of Heat.

This *Serum* which is thus found, by Experiment, endued with this Variety of Qualities, is that from whence all the *Solids*, and ſecreted *Fluids* of a human Body, are continually ſupply'd and repaired.

There is no Solid but what is compoſed of ſmaller Parts exactly like the greater; (*a*) *Leuwenhoek* has diſcovered that the *Pectoral Muſcle* of a *Flea*, is the ſame in Form as the *Pectoral Muſcle* of an *Ox*, and (*b*) that the largeſt *Muſcles* in the *Body* are compoſed of ſmaller *Muſcles*, which differ only in *Magnitude* not in Form. (*c*) *Malpighius* and (*d*) *Havers* diſcovered, that the *Bones* conſiſt of ſeveral *concentric Cylinders*, the ſame in Form, tho' gradually decreaſing. The larger *Veſſels* conſiſt of ſmaller, and the minute *Veſſels* which have been diſcovered, and appear to be incredibly ſmaller than the fineſt Hair (*e*) are in Form like the largeſt. A *Sanguiferous Artery* before it ends in a *Vein*, is ſo ſmall that it only admits one Globule of Blood, and throws of a *lateral Branch* whoſe *Diameter* is $\frac{1}{6}$ leſs than the laſt *Orifice* of the *Sanguiferous Artery*: this is the Origine of the *Serous Artery*, which after being

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(*a*) *Tom.* 2. *pag.* 31. (*b*) *Tom.* 1. *part.* 2. *p.* 46, 47. (*c*) *Tom.* 2. 214. (*d*) *Oſteologia nova. Tab.* 1 *Fig.* 1. *a. a. et. pag.* 42. (*e*) *Leuwenh. Tom.* 2. *p.* 57. 58, greatly extended and ramified, before it terminates in a *Serous Vein*, emits a *lateral Branch*, whoſe *Diameter* is $\frac{1}{6}$ leſs than the laſt *Orifice* of the *Serous Artery:* This is the Origine of the *Lymphatic Artery*, which after various *Ramifications*, ends likewiſe in a *Lymphatic Vein*. The *Humours* that peculiarly belong to theſe *Veſſels*, decreaſe in the ſame Proportion; for a *Globule* of *Blood* is compoſed of Six *Globules* of *Serum*, (*a*) and a *Globule* of *Serum* is compoſed of Six *Globules* of *Lympha*. Thus far Diſcoveries have been made by the Uſe of *Microſcopes*, and *Injections*, and it is more than probable that there are ſeveral decreaſing *Series* of *Veſſels* yet undiſcovered, that can no more be the Object of our Sight than *Air*, their *Humours* being ſo pellucid that the *Rays of Light* are tranſmitted, not reflected from them; and their *Orifices* ſo ſmall, that no artificial *Liquor* yet known can be injected: But it may be ſafely concluded, that the

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(*a*) *Leuwenhoek Tom.* 1. *pag.* 32. *Tom.* 2. *p.* 3.

Veſſels undiſcovered are in Form like the largeſt, ſince ſo great an Uniformity is to be obſerved through the whole *Animal Oeconomy*, and ſuch an exact *Analogy* is particularly kept up between the greateſt, and the moſt minute *Veſſels*, which can only be perceived by the fineſt *Microſcopes*.

The Quantity of the *Fluids*, greatly exceeds that of the *Solids:* The Difference between a *fat*, and a *lean* Man, chiefly conſiſts in a Collection of uſeleſs, inactive *Oil*, which oppreſſes the *Body* of the former; for ſuch a one *emaciated* by a *Conſumption*, has ſtill the ſame Number of *Veſſels* as before, tho' more waſted and abraded; for he then retains the perfect Uſe of his Reaſon, and Senſes; and if any of the *Solids* by this *Conſumption* were entirely Deſtroyed, the *Veſſels* of the *Brain* as being moſt tender, could not eſcape: This great Diſparity may be likewiſe hence confirmed, that of twenty five Grains of the *Brain* expoſed to the Air, twenty four exhale, and only one Grain of Solid remains. Even the *Bones*, waſhed ed often with Water, and expoſed to the *Sun*, loſe nine Parts in ten.

All the *Solids* are *nervous*, and take their Origine from the *Brain*, for (*a*) *Malpighius* has obſerved, that the *Embryo* in the *Womb*, whoſe Form is like a Worm, and which firſt conſtitutes the *Spinal Marrow*, is the *Baſis* from whence all the *Solids* in the *Body* proceed. Five *limpid Drops* grow from it, which afterwards form the Lobes of the *Brain*, from which the two *Globes* of the Eye next appear; from the Middle of the *Carina* ariſes an incurve *Tube*, that has four unequal *Protuberances*, which by Degrees inclining to each other, form the *Heart*; from whoſe *Tendons* the *Veſſels* take their Origine: All the *Glands*, *Bowels*, and *Membranes*, are formed of theſe *Veſſels* variouſly diſpoſed, the *Bones* are formed from *Membranes* hardning by Degrees to *Cartilages*, and then to *Bones*; from whence it appears that every Solid *Stamen* of the *Body* is *Nervous*.

(*a*) *De ovo incubato pag.* 70. *ad* 83.

The gradual *Alterations* which (*a*) *Ruyſch* has obſerved in human *Embryos*, agree ſo exactly with the Obſervations which *Malpighius* has made on the Egg, that it ſeems very neceſſary firſt to ſhew how the ſmall *Embryo* in the *Egg* is nouriſhed, and what *Alterations* happen 'till the *Chicken* is produced, before a juſt Account can be given how *Nutrition* is performed in a human *Body*.

The *Shell*, or outward *Integument*, proceeds from a *mucilaginous Humour*, ſeparated from ſeveral *Glands* placed near the *Anus*, which hardens by Degrees, the *Egg* being entirely ſoft three Days before its *Expulſion*; next to this lies a tenacious *Membrane*, which may be conſidered as the internal *Perioſteum* or the *Dura Mater*; under this lies another *Membrane*, more tender than the Former, like the *Pia Mater*. The *Egg* has two *Angles*, the one obtuſe, and the other more acute, the *Yelk* lying in the *Center*. Between

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(*a*) *Theſaur.* vi. *Tab.* 2. *Fig.* 1. 2. 3. 4. 5. *Tab.* 3. *Fig.* 1. 2. 3. 4.

this, and the Shell, the *White*, or *Albumen* is placed, which is not a looſe Fluid contained in one Cavity, but conſiſts of ſeveral *Series* of *concentric*, thin *Membranes* gradually decreaſing, like ſmall *Circles* within a large one. Between each of theſe the *Albumen* is contained, in whoſe *Center*, between the obtuſe *Angle*, and the *Yelk*, the *Embryo* is placed in a ſmall *Bag* containing a ſingle *liquid* Drop.

The *Hen* broods on this *Egg*, and by her *genial Heat* the white next to her Body, contained between the firſt, and ſecond Membrane, begins to be attenuated, and to move by degrees into the next, and the *Motion* and *Warmth* being continued, is by progreſſive *Undulations* propelled through the various *Series* of the *Albumen*, 'till it arrives at the ſmall *Bag*, where it is received by the *Embryo* for *Nouriſhment*.

How great the Attenuation of this *Humour* muſt be, appears to any one who conſiders the minute Size of the *Animalcule* receiving it for Nouriſhment,

ment, *a* (*a*) *thouſand* of which are ſcarce equal to a *Grain of Sand:* But this *Humour* tho' already wonderfully attenuated, muſt be yet much more ſubtilized, before it is ſufficiently prepared for *Nouriſhment*, and can circulate through all the decreaſing *Series* of *Veſſels*, which tho' not viſible, are *ichnographically* deſcribed in the *Embryo* (*b*) even of the moſt minute *Animal*; for as yet there is as great a Difference between it, and the laſt elaborate *Juice*, which nouriſhes the *Embryo*, as between the crude *Chyle* in a human *Body*, and that *Fluid*, which conſtantly evaporates by inſenſible *Perſpiration*.

There appears to be no difference between the *White* of the *Egg*, and the *Serum* of the Blood: For however variouſly examined, they afford in every Reſpect the ſame *Phænomena*, (*c*) and the Alterations which each receives in being prepared for Nouriſhment, depend on the ſame Cauſes. The *Secretion* of the former proceeds from the

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(*a*) *Leuwenh. Tom.* 3. *p.* 368. (*b*) *T.* 1. *p.* 8.
(*c*) *Vid. p.* 39.

Heat of the *Hen* ſitting on it, and if the *Heat* apply'd to the *Egg*, is greater than that which is natural to the *Hen*, it no longer remains fit for Nouriſhment, but becomes coagulated, neither will it nouriſh if the *Heat* be leſs; but if a juſt Degree of *Heat*, tho' artificial, be preſerved, the *Embryo* will be thereby nouriſhed, and brought forth. (Which Method has been ſucceſsfully practiſed with Stoves in *Ægypt* (*a.*) After the ſame Manner, the Action of the Veſſels produces the ſame Alteration on the *Serum* in a human *Body*, as the *Heat* of the *Hen* on the *Albumen* in the *Egg*; for when that is regular, and equal, it diſſolves to the greateſt Degree of Fluidity, 'till it is capable of entering, and nouriſhing the decreaſing *Series* of *Veſſels*: But whenever the Action of the *Veſſels* on the *Serum* is increaſed, it acquires an *inflammatory Viſcidity*; and as the *Humours* circulating in the laſt *Veſſels* of a human *Body*, where *Nutrition* is chief-

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(*a*) *Plinii hiſtoria natural. Lib.* x. *Cap.* 54.

ly performed, retain no longer a coagulating Quality, but are ſo fine as entirely to exhale, ſo likewiſe the *Albumen* when prepared fit to nouriſh the *Embryo* by paſſing through the decreaſing *Series* of *Membranes*, will by no Means coagulate, if expoſed to any Degree of *Heat*. (*a*) Beſides the *Heat* of a healthy Man meaſured by a *Thermometer*, is the ſame as the genial *Heat* of the *Hen*; and where there is the ſame Degree of *Heat*, we may ſafely conclude there is the ſame Quantity of Motion; therefore *Nutrition* muſt be performed after the ſame Manner in each, for where the *Materials*, and the *phyſical Cauſes* are the ſame, ſo will their Effects be.

The *White* of the *Egg* alone gives *Nouriſhment* to every part of the *Embryo*, unleſs ſome Exhalations which proceed from the *Hen*, or the Air, may in ſome Meaſure perhaps contribute to it: And that ſuch ſubtle *Particles* fit for *Nouriſhment*, by that Means come to

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(*a*) Bellin. de Motu Cordis. Propoſ. VI.

the *Embryo*, is ſufficiently manifeſt, becauſe the *Chicken* weighed immediately after it is produced, is heavier than the White was, whereas that alone is conſumed, the *Yelk* ſtill remaining entire. So neither from the *Serum* alone in a human *Body*, is Nouriſhment obtained; for the Air is a common *Chaos* of all ſorts of ſubtile *Bodies* perpetually floating in it; and it is more than probable, that among them there are ſeveral Exhalations from *Animals*, and *Plants*, fit to afford *Nouriſhment*; and that ſuch are received into the *abſorbent Veſſels* of the *Body*, is moſt evident from ſeveral *Experiments*, and particularly from *Obſervations* made on *Hydropical Perſons*, who are apt to receive a conſiderable Addition to their Weight in a moiſt Air, from the Water imbibed through their Pores; but there is no Water, as will hereafter appear, but what contains *Particles* fit for *Nouriſhment*.

Thus I have endeavoured to give a ſhort Account of the Origine, and Nature of our *Solids*, and *Fluids*; which laſt if rightly elaborated, always contain Parts fit to repair the perpetual Decays of the *Body*; it only remains now, more particularly to deſcribe the Manner how this *Nouriſhment* is performed.

The ſeveral *Canals* in a human *Body* have new empty *Interſtices* perpetually made in them, which require a conſtant Repair, by being *abraided* by *Attrition*, the unavoidable Effect of *Motion*, and by being *diſtracted* by the preſſing Force of the circulating Humours; for ſince all the Lines of a Fluid, moving in a Conic Veſſel from its *Baſis* to the Extremity of it, are parallel to the *Axis* of the *Canal*, all the Points of that *Fluid* (except that *Cylinder* the *Diameter* of whoſe *Baſis* is equal to the laſt *Orifice* of the *Artery*) muſt neceſſarily move with a *Reſiſtance* to their *Motion*, and endeavour to *extend* the Sides of that *Canal* according to its longer *Axis*; but all the *Veſſels* being *elaſtic*, reſiſt and repel that *Fluid* with the ſame *Force*, and the *Preſſure* of the ſucceeding *Humours* being

ing too great to ſuffer its Retreat, it muſt unavoidably preſs againſt, and diſtend the Sides of the *Canal*; by which Means it will be likewiſe *widened* in every Point: But as its *Reſiſtance* increaſes in Proportion to its *Diſtention*, ſuch a ſuperior *Force* is thence received from its ſucceeding *Contraction*, as is ſufficient to propel, and continue the *Circulation*. From this *Action* of the *Humours*, and *Reaction* of the *Veſſels*, depends that *Motion* of the *Blood*, which is obſervable from a diſſected *Artery*; and which does not flow in a free equal *Stream*, but has a ſubſultory interrupted *Motion*.

This *Diſtention* of the *Canal*, by which Means the Parts of it are ſeparated, produces the Want of a new Supply more than the *Force* of *Attrition* in tender young *Animals*, and *cæteris paribus*, the leſs diſtant they are from their *Origine*, the greater the *Diſtraction* of the *Fibre* is; but it is probable, that in the ſame Proportion this decreaſes, the *Force* of *Attrition* increaſes; for the more firm any *Body* becomes, the greater is the Difficulty to ſeparate its Parts by *Motion*, and the more capable it is by the ſame Means to excite a violent *Attrition.*

Hence it appears, that a human *Body* continues to grow, while the *impelling Force* of the *Heart* is greater than the *reſiſting Force* of the *Veſſels*; and remains at a ſtand, while there is an *Æquilibrium* between the impelling *Force* of the one, and the Reſiſtance of the other. But as the *Veſſels* gradually become more compact, and ſolid, they begin in their Turn to get the better of the *Force* of the *Heart*, *Old Age* advances in the ſame Proportion, and (if the Expreſſion may be allowed) the Man grows back again.

Hence the Defects of *Old Age* are firſt obſervable in the Loſs of the fineſt *Animal* Faculties, for the *Veſſels* deſtined for theſe Uſes, as being moſt minute, are firſt compreſſed, a *Lethargic Indolence* ſeizes every Part, the *Veſſels* gradually become more inflexible, 'till at length their *Reſiſtance* is ſo great, and the *contracting Force* of the *Heart*

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from its *Rigidity* ſo weak, that it is at length incapable of expelling what it contains, and regularly deſiſts from *Motion.* Such a one cannot ſo properly be ſaid to die, as that he ceaſes to live.

Hence it is evident, that a human Body is gradually deſtroyed by the ſame *Circulation* which ſupports it, that the more quick the Motion of the *Blood* is, the ſooner old Age will advance, and that (*cæteris paribus*) the Number of Years to which all Men may attain, will be in a *reciprocal ratio* to the *Velocity* of their Pulſes. Thus allowing 70 or f Years for the common Age of Man, and 60 or b Pulſes in a Minute for the common Meaſure of Pulſes in a *temperate Perſon*, and putting c for the Number of Minutes in a Year; then $cbf = 2209032000$ the Number of Pulſes in his whole Life. But if another by *Intemperance*, forces his *Blood* into ſuch a Motion as may give 75 or z *Pulſes* in a Minute, then $\frac{cbf}{cz} = \frac{bf}{z} = 56$ the Number of Years in which ſuch a Perſon will run out the ſame Number of *Pulſes*, which by the former Computation would hold to threeſcore Years and ten, by which Means he will finiſh his limited Number of Pulſes or Years *fourteen Years* ſooner than otherwiſe, and univerſally $z : b :: f : \frac{bf}{z}$.

Hence it appears, how abſolutely neceſſary *Temperance* is to prolong Life, without conſidering the ſeveral Accidents which an irregular Courſe is ſubject to, and which by bringing on *Acute*, and *Chronic* Diſorders, frequently cuts ſhort, and finiſhes the Age of Man long before its natural, common *Period*; for tho' *Intemperance* ſhould happen to be exempted from any ſudden Danger, yet by quickning the *Wheels* of the *Machine*, it muſt unavoidably haſten the Unravelling of the *Thread of Life*, which would otherwiſe be more ſlowly ſpun out to a greater Number of Years. This is not only agreeable to the ſtricteſt Reaſoning, but is confirmed by repeated Obſervation; ſince ſuch Perſons who are moſt remarkable for their *Temperance*, who live chiefly on *Vegetables*, and uſe *Wine*, and an *Animal Diet* ſparingly, commonly live to the greateſt Age. The great Lord *Verulam* (*a*) has obſerved of all Animals in general, that, *cæteris paribus*, ſuch who have a cold Conſtitution, live in Proportion longer than ſuch who have a warm, active Temper. It may be obſerved likewiſe, that the Age of Man, which before the *Flood* was very great, when ſuch Things were taken for *Food* which the Earth produced, quickly decreaſed when the Uſe of *animal* Diet was allowed.

The ſame *circulating Force* of *Humours* that deſtroys the Solids, repairs them, the one is ſucceſſive to the other: (if the *Humours* be well prepared) for the *circulating Fluid* by its Motion abrading a *Particle* of the ſolid *Canal*, may with the ſame *Force* immediately ſupply another; and that abraded *circulating Particle* may be apply'd to a different *Pore*, and be again ſolid. This *Expulſion*, and *Re-application* of *Particles*, is perpetually continued

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(*a*) *Hiſtoria Vitæ et Mortis.*

through the whole *Longitude* of the *Canal*; but at the End of it, this abraded *Particle* unavoidably exhales, and is loſt: This *Exhalation* is conſtant in four Parts of the Body, where the Extremities of the *Veſſels* terminate; *viz. In every Part of the Surface of the Body.* 2. *In the large internal Cavities.* 3. *In the Glands and* 4. *Between the Surfaces of the contiguous Veſſels.*

Every *Veſſel* is nouriſhed, and abraded by the ſame *Humour* that circulates through it: The *Serum* alone circulates through all the decreaſing *Series* of *Veſſels*, but in the moſt minute, and diſtant, is more *attenuated*, and *ſubtilized:* The ſides of the larger *Canals* are compoſed of various *Complications* of ſmall *nervous Veſſels*; as a *Cable* is made of ſmaller *Ropes*, gradually decreaſing, all which conſiſt of ſmall *Threads* of *Hemp*, variouſly twiſted, and interwoven.

Nutrition is therefore moſt perfectly performed in theſe minute diſtant *Ramifications*, which compoſe the greateſt Part of the *Body*, and contain the moſt elaborated *Juices*; and not only requires a juſt *Preparation* in the *circulating Materials* of *Nouriſhment*, but a due *Afflux* of *animal Spirits* to the *Veſſels* which are to be nouriſhed; for it is obſervable, that any Part of the *Body* quickly languiſhes and decays, if either the *Nerve*, or *Artery* which is deſtined to it, be deſtroyed: But however this Inaptitude for *Nouriſhment*, which ſucceeds the Deſtruction of a *Nerve*, does not prove that the *animal Spirits* can repair, or increaſe the ſolid *muſcular Parts* of the *Body*; (for we find that *conſumptive* Perſons have frequently a large Stock of *Spirits*, and that fat Men are rather remarkable for an *Inactivity of Mind*) tho' a free *Influx* of them into ſuch Parts as are to be nouriſhed, is abſolutely neceſſary; for the *Circulation*, and conſequently *Nutrition*, not only depends on the *Force* of the *Heart*, but on the *vibrating Motion* of the *Veſſels*, which is entirely owing to theſe *animal Nerves*, which take their Origine from the *Brain*, and cloſely encircling all the various *Ramifications* of the *Aorta*, afford that ſenſile *Energy*, which enables them to give a *Motion*, and *Appoſition* to the Materials of *Nouriſhment*, which the *Veſſels* otherwiſe inactive, only contain, and ſupply.

Thus the *Antients* with great Reaſon diſtinguiſhed three ſorts of *Nerves*, *Animal*, *Vital*, and ſuch as are principally deſigned for *Nouriſhment*; the two former proceeding from the *Cerebrum*, and *Cerebellum*, and are only the extreme Productions of the *Carotids*, and *Jugulars*, as the others are the laſt *Ramifications* of the *Aorta*: They are all equally (*a*) *nervous*; the *Humours* they contain are ſeparated from the ſame *Blood*, and receive in a great Meaſure their different Properties, from the different Complication of theſe almoſt infinitly extended *Veſſels*.

The laſt conſtituent ſolid *Stamina* of a human Body, are mere *Earth*, for they are not diſſolvable in *Water*, *Fire*, *Oil*, *Spirit*, or *Air*; neither is the

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(*a*) *Vid.* *Pag.* 40.

ſtrongeſt Force of *Fire*, tho' ever ſo long continued, ſufficient to deſtroy the *mechanic Form* of a *Hair*; but theſe pure, *elementary* Parts, by repeated *Attritions*, and *Comminutions*, are ſo attenuated, that they conſtitute part of the moſt *fluid Humour*, which enters into the moſt minute *Nerves* of the *Body*; otherwiſe they could not nouriſh, if their Parts were not leſs than the *Orifice* of the moſt minute *Nerve* in the *Body*, which is to be nouriſhed; but all the large *Veſſels* are formed from theſe ſmall *Veſſels*, and conſiſt of ſuch *Materials* as at firſt *nouriſhed*, and increaſed their *Bulk*; but by a *chymical Analyſis* reſolved, and ſeparated, they yield nothing ſolid but *Earth*; therefore that which compoſed them, was only *Earth*. Thus *Moſes* formerly pronounced that great Oracle of Truth, That *God at firſt formed Man out of Earth*: And hence in ſeveral Paſſages of the Poets Men are called Αὐτόχθονες *Terrigenæ, Terræfilii.*

Theſe terreſtrial Parts which are the *Baſis* of a human *Body*, have not of themſelves a ſufficient Attraction, and Coheſion, to give it a proper *Solidity*; but receive this Advantage from an intermediate glutinous *Humour*, which is either *aqueous*, or *oleaginous*; but by the repeated *Action* of the *Veſſels*, as by frequent *Diſtillations*, is attenuated to the greateſt Degree of *Fluidity*. Thus *Bones*, that have been expoſed to the Air for the Space of twenty Years, contain half their Weight of Water, and when ready to moulder into Duſt, recover ſoon their *Solidity* by pouring Water, or Oil on them; for Water, mixed with ſeveral Bodies of a ſoft Nature, gives them the greateſt Firmneſs; as it appears in that ſort of clammy Clay, of which *chymical Veſſels* are formed, by being mixed with Water, by the Aſſiſtance of which it hardens to ſuch a Degree, that theſe Veſſels cannot again be diſſolved in Water, and reſiſt the greateſt Degree of Fire better than any other ſort.

Hence appears the Reaſon, why the *Veſſels* are not diſſolved by the circulating *Humours*? and why ſome of the

Solids, as the *Bones*, are harder than the reſt? the Circulation, being much weaker in their *Veſſels*, than in any other, the *Abraſions*, and *Recruits* are neither ſo great nor ſo frequent, by which Means they have more Time to harden: Thus *Veſſels* formed from Clay, are at firſt yielding, and ſoft, and grow firm by Degrees.

All the difference between the *Solids*, and the nouriſhing Parts of the *Fluids*, is that the former are more at Reſt, and have a ſtronger Coheſion; and that the latter are more ſeparated, and in perpetual Motion; for if a thouſand ſmall *Globules* be ſuppoſed to move in a proper Vehicle, through a *Canal* compoſed of the ſame *Materials*, tho' they are then to be conſidered as *Fluid*, yet if one of them ſhould be preſſed into a ſmall Pore of the *Canal*, it ſtops there, and becomes Solid; and by being at firſt prominent, ſuſtains in that Point, the whole Force of the circulating Fluid, which was before ſuſtained by ſeveral Points of that *Canal*: (as is evident from the Doctrine of

Hydraulics) by which Means it is ſoon fixed, and conſtitutes a *Particle* exactly like that which is loſt.

Hence appears the Reaſon, why ſcars proceeding from the ſmall Pox, or other Cauſes, perpetually retain the ſame Form, notwithſtanding the Veſſels are ſo often *abraded*, and *recruited*? And how erroneous (*a*) *Keil*'s Opinion is, who from hence imagined, that the *Solids* of the *Body* never received any *Decay*, or *Addition*; and that *Nutrition* conſiſted only in adding to the *Fluids*, and diſtending the *Solids*: But if this were true, it muſt conſequently follow, that the *Fibres* of a robuſt *Man* ſhould be weaker, as being more diſtended, than the *Fibres* of an *Infant*; and if he had ever obſerved, that the hardeſt Stone is at length made hollow by repeated Drops of Water, he could never have imagined that the *Veſſels* in a human *Body* were ſo invincibly *Strong*, nor that the Force of *Circulation* was ſo very *languid*. But this

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(*a*) *Tentamen primum, de Sanguinis Quantitate.*

ingenious Gentleman ſeems in ſome Meaſure to fall into this Error, that he might from thence explain the Poſſibility of the *Reſurrection* of the ſame Body. But cannot the Truth of this be more plainly deduced from the former Theory? Since it has been proved that the *Solid* Parts of *all Animals* conſiſt of the *ſame unchangeable Materials*, (*a*) and therefore not to be altered, even by the laſt *Conflagration.*

Nutrition is ſcarce the ſame in any two different Perſons; for it is varied according to the Difference of Age, Conſtitution, and Manner of living. Hence (*b*) *Hippocrates* obſerved that *Infants* cannot bear *Abſtinence*; for the nearer the Veſſels are to their firſt Origine, the more eaſily they yield, and are diſtended by the circulating *Humours*, and the greater Supplies are thence wanted to fill up the empty Spaces. Lean men (*cæteris paribus*) wear faſter, and require larger Recruits than fat Men, their Fluids being generally

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(*a*) *Vid. pag.* 37.

(*b*) *Lib.* 1. *Aph.* 13. 14.

more *acrid*, and agitated with a greater *Velocity*; and for the ſame Reaſon, ſuch as uſe Exerciſe, more than ſuch as live an indolent Life; who are generally remarkable for having a weak *Appetite*.

Nutrition is not equally performed in any two parts of the Body, the Force of *Circulation* being different in every Point, between the *Heart*, and the laſt Extremities of the *Veſſels*: Through every Part of the *Body* there is a peculiar *Circulation*, and but a very ſmall *Quantity* of what paſſes through the Heart circulates through the whole *Body*. The quickeſt *Circulation* is in the *Coronary Arteries*, diſtributed through the Subſtance of the *Heart*, which, allowing ſixty Pulſes in a Minute, is performed in $\frac{1}{3600}$ of an Hour. Theſe *Arteries* terminate in three different Places, in the *Cavity* of the *right Ventricle*; in the *Cavity* of the *two Auricles*; and in the *Coronary Veins*. The *Circulation*, which is next performed in the ſhorteſt Space of Time, is through the *Bronchial Arteries*, which take their Origine ſometimes from the *Aorta*, and from the *firſt*, *ſecond*, and *third Intercoſtal:* The next Circulation is through the *Intercoſtal Arteries*, and then through the *Diaphragma*. The returning *Blood* from theſe ſeveral Places is for the moſt part received into the *Vena Azygos*, near the *right Ventricle*; and it may be laid down for a *general Rule*, that, (*cæteris paribus*) the nearer the Origine of the Artery is to the *left Ventricle* of the *Heart*, and its returning *Vein* to the *right Ventricle*, the quicker, and ſtronger the *Circulation* is through ſuch *Parts*, and conſequently the *Abraſions*, and *Recruits* are more frequent in ſuch *Veſſels* than in any other.

Hence it appears, how erroneous (*a*) *Lower*'s Concluſion is, who, from the given *Quantity* of *Blood* in the *Body*, and the *Quantity* paſſing through the *Heart* in ſuch a Space of Time, would from thence determine, in what Space the whole *Maſs of Humours* circulates through the *Body*; not conſidering that part of the two Ounces,

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(*a*) *De Sanguinis motu et colore.*

which are ſuppoſed to be expelled from the *Heart* every Pulſation, is propelled into the *Coronary Arteries*, and returns in the $\frac{1}{3600}$ of an Hour, allowing ſixty Pulſes in a Minute; and what Part of the two Ounces paſſes to the Extremities, requires a long Time to return. Before he could make a juſt Computation of this Nature, he muſt have known the Diſtance of every *Ramification* of the *Aorta*, and of its returning *Vein*, the *Quantity* of *Blood*, and the *Velocity* with which it circulates through each *Veſſel*; but this ſeems impoſſible to be calculated.

Is not the Manner of *Nutrition*, and the Materials of *Nouriſhment*, the *ſame* in all *Animals*, and *Plants*? And is not the Reaſon why all cannot be nouriſhed by the ſame *Food*, owing to the different Strength of the *Veſſels*, and of the circulating *Humours*, (by which Means what would afford Nouriſhment to one, is either too groſs, or too ſoon carried off, and diſſipated by the other) rather than to a Difference of the *Materials* required? Since from the ſtrongeſt *Animal*,

mal, to the moſt tender *Vegetable*, the Strength of the *Food* is always proportioned to the Strength of the *Veſſels*, and circulating *Humours*; and that whatever is uſed for *Diet*, from the ſtrongeſt *Food*, to Water *depurated* by repeated *Diſtillations*, *chymically* examined, affords the *ſame terreſtrial*, *ſolid* Parts for *Nouriſhment*, tho' in a different *Quantity*.

Nothing more contributes to promote *Nutrition* than *Sleep*; for then the *Humours* are generally ſupply'd with a greater *Quantity* of *nouriſhing Parts*, fit to recruit; and the *Attritions*, and *Abraſions* of the *Solids*, are neither great, nor frequent; for according to the *Laws of Motion*, the *Momentum* of the circulating *Fluids* decreaſes in Proportion to their Diſtance from the *Heart*; or firſt Cauſe of Motion: Neither is the Force of the *Heart* alone, ſufficient to continue the Motion of the *Humours* through all the *Veſſels*; for in the ſmall diſtant *Canals*, the *Circulation* is chiefly promoted by the compreſſing *Force* of the *Muſcles*; but as this *Motion* in the time of *Reſt* entirely ly ceaſes, and ſince no other *Motion* is continued but what is received from the *Heart*, it muſt in the decreaſing *Series* of *Veſſels* gradually grow more languid, till at length it almoſt ceaſes in the *laſt*, and moſt *minute Veſſels:* Hence the *Circulation* muſt unavoidably be ſtronger in the larger *Veſſels*, by which Means the *Chyle* by more frequently paſſing through the *Lungs*, and receiving more repeated *Alterations*, and *Comminutions* from the Action of this *Bowel*, is ſooner changed into *Serum*, than if it could circulate through the more minute lateral *Veſſels*, which could not act ſo ſtrongly on it: Beſides the Heat of the *Body*, which at the Time of waking is greatly varied, is now conſtant and equal; neither is there a Variety of *Preſſure* in the *Veſſels*, nor a diſproportioned *Velocity* in the *Humours*, but theſe are as fit to enter, as the others are to receive them. Hence the *Serum* through the various progreſſive *Series* of *Veſſels* is gradually reſolved into more *Fluid Parts*, and the *Veſſels* that were before *abraded* by too

Violent *Motion*, are now gently *repleniſhed* and *recruited*.

From this *Theory of Nutrition* it evidently appears, that all *Atrophies*, however variouſly diſtinguiſhed by *Morton*, and others, proceed either from the Humours not being juſtly prepared for *Nouriſhment*, or from the *Veſſels* not being juſtly diſpoſed to receive them, or from the Force of *Circulation* being either too *great*, or too *languid*.

The former will happen from an improper *Diet* being uſed, which will not afford *Parts* fit for Nouriſhment, but gives a waſting *Acrimony* to the *Fluids*; or from a peculiar *Weakneſs* in the *Organs* of the firſt or ſecond *Digeſtion*, which prevents the *Serum* from being rightly *elaborated*: This may often proceed from any *Secretion* of the *Body* being increaſed, and continued beyond its juſt *Proportion*; for in ſuch a caſe the *Body* muſt languiſh, and decay, not only from the *Veſſels* being emptied, and deprived of their *Juices*, but from being more incapable than when ſuch large Supplies were not wanting of reducing the *Food* into *Nouriſhment*; for that cannot be performed without a juſt *Mixture* of the *natural Juices*: This is the Reaſon why any *Secretion* being prevented, will likewiſe produce a Decay. The natural *Juices* being thereby often depraved, give the ſame *Tincture* and *Diſpoſition* to the *Chyle*, when mixed with it, and by that Means render it unfit for *Nouriſhment.*

An *Acrimony* of the *Fluids* (tho' frequently the Cauſe) is likewiſe the unavoidable *Effect* of a *Circulation* too active; in which Caſe a Decay muſt be ſoon produced from the *Abraſions* of the *Solids* being increaſed, and from an Inapitude in the *Fluids* to repair them. When the *Circulation* is too languid, *Obſtructions* being from thence formed in the ſmall *Veſſels*, ſuch as proceed from them, muſt ſoon waſte, and languiſh from the Want of an Influx of *Nouriſhing Materials* to lubricate and diſtend them; and the finer *Secretions* from the ſame Cauſe being prevented, other *Parts* will be *overcharged*, and various Diſorders thence excited. A Decay in each Caſe is produced from a different Cauſe; the former is generally attended with *hectick* irregular *Heats*; the latter with a cold *Languor* in the extreme *Parts*; tho' from thence *hectick Heats* are at length produced, the *Stagnating Fluids* being rendred *acrid*, and the *Circulation* more active in ſuch *Veſſels* as are not *obſtructed.*

As the *Cauſes* which produce ſuch Diſorders are various, ſo are the Indications, and Method of Cure, and may be eaſily deduced from what has been delivered. But in general no *Diet* is ſo proper, to repleniſh a decay'd Conſtitution with kindly *Juices*, where the *Organs* of the firſt and ſecond *Digeſtion are impaired*, as the *Whites* of new laid Eggs, diſſolved, and taken *Blood-warm*, in any convenient *Vehicle*: Nothing is more free from *Acrimony*, or more capable of correcting that Diſpoſition in *Conſumptive Fluids*; by its near Affinity to the *Serum*, 'tis moſt eaſily aſſimilated, and by proper Exerciſe immediately changed into *Blood*.

A remarkable Inſtance of this Nature, I lately obſerved in one Mr. *Henry Allen*, a Maſter of a Ship, who had languiſhed for ſeveral Months in a *Scorbutic Dyſentery*, and was *emaciated* to the laſt Degree. He received no Relief from the moſt powerful *Aſtringents*, but rather an Increaſe of his *Symptoms*. I adviſed him to take no *Nouriſhment* for three Weeks, but the *Whites* of new laid Eggs, diſſolved in the *Decoct: alb*: prepared with *aq: Calcis*: By which Means and the Uſe of *ol*: *amygd dulc*, *Sperm. ceti*, and ſuch *ſoft Balſamicks* and *Anodynes*, tho' before deſpaired of, he was quickly reſtored to perfect Health.

That *Conſumption*, which is called a *Phthiſis*, can only proceed from a *Collection of purulent Matter*; from whence it is perpetually by the *Abſorbent Veſſels* received into the *Maſs of Blood*, waſting the *Solids*, and corrupting the *Fluids*. In whatever Part of the *Body*, either from an *Ulcer*, or *Abſceſs*, there is a ſufficient *Quantity* of ſuch *Pus* collected, a *true Phthiſis* will thence enſue;

ſue; which is always Proportioned to the *Magnitude* of the Ulcer, its *Situation*, and the *Uſefulneſs* of the Part affected, to continue the *Functions of Life*.

External Ulcers ſeldom produce a *Phthiſis*, becauſe the Hand of the Surgeon can cleanſe them from the greateſt Part of the *purulent Matter*, which otherwiſe would be *abſorbed*; yet when ſuch are very large, or ſituated in ſpongy Places, and particularly in the *Breaſt*, after an *Amputation*, a mortal *Phthiſis* frequently follows; and Books of Obſervations abound with Inſtances of this Nature.

Hence appears the great Variety of Conſumptions proceeding from a *Suppuration*, which might equally happen to the *Liver*, *Kidney*, or *Spleen*; or to any other *Bowel*: The Indications of Cure are always the ſame, peculiar Regard being had to the *Part* affected.

The deſigned Brevity of this Treatiſe prevents me, at preſent, from entering into a particular Deſcription of theſe ſeveral *Diſtempers*; but as a *Phthi-*

ſis of the Lungs is moſt frequent, and dangerous, and in a great Meaſure includes the Knowledge of all others, I ſhall treat of it in Particular; and after giving an *Anatomical* Deſcription of the *Parts* principally affected, and their Uſe, ſhall endeavour to give an exact Account of the various Origine, and Progreſs of this *Diſtemper*, through its different Stages, with the moſt Rational Method of Cure, carefully deduced from *Anatomical Obſervations*, and *Mechanic Principles*.

PART the II.

OF THE Structure *and* Uſe OF THE *LUNGS.*

THE *Lungs* are formed for a twofold Uſe, *Reſpiration*, and *tranſmitting* all the *Humours* of the *Body* through them; and have peculiar *Organs* deſtined for theſe Uſes; ſo that their Subſtance is chiefly compoſed of *Aerial Tubes*, and *Sanguiferous Veſſels.*

The *Aerial Tubes* are divided into *four* Parts, the *firſt* is the *Larynx*, or *Opening*, which gives a Paſſage to the Air, and is not only cloſed by the *Aperture* of the *Glottis*, as 'tis commonly ſuppoſed, but has likewiſe two *Muſcles* belonging to it, by the Action whereof it can be ſo firmly cloſed, that thence it becomes capable of retaining the Air, and by its different Degrees of *Contraction* modulates, and varies the Voice; the *ſecond Part* is the *Trachæa*; the *third* where it begins to divide, and loſes that Name, the Ramifications are then called *Bronchia*; the *fourth Part* conſtitutes the *Cellules*, and *Veſicles* diſcovered and deſcribed by *Malpighius.* (*a*)

There are alſo *four ſanguiferous Veſſels*; the *Pulmonary Artery*; the *Pulmonary Vein*; the *Bronchial Artery*; firſt diſcovered by *Ruyſch*; (*b*) and the *Bronchial Vein*; the minute *Ramifications*

(*a*) *Malpig. de Pulm. Epiſt.* 1. 2. *T.* 1. *F.* 1. 2. 3.
(*b*) *Reſp. ad Epiſt. Anat. Problem.* 6 *tam.*

tions whereof at length, by gradual Conjunctions, form one *Canal*, which ends in the *Vena Azygos*. The *Nerves* which are diſperſed through the *Lungs* proceed from the *Intercoſtal*.

The *Trachæa* conſiſts of *five Membranes*, the *firſt* is *Glandular*, and is always lubricated with an unctuous Humour, ſeparated from Glands, the Orifices of which terminate there, by which Means the Air is more eaſily capable of paſſing, and repaſſing; the *ſecond* is *Muſcular*; the *third* is *Vaſcular*; the *fourth* is *Cartilaginous*; which becomes finer the more it is extended, and is at laſt entirely *Membranous*; the *fifth* is received from the *Pleura*.

Theſe *Cartilages* are orbicular, and are connected by the *muſcular Membranes*, intermediate between each *Cartilage*, and are by ſome called the *Meſochondrion Muſcles*; By their Diſtention the *Trachæa* is lengthned, whenever the Neck is extended; and the Spring, and Force of the *Lungs* is, in a great Meaſure, owing to their Endeavours of contracting themſelves,

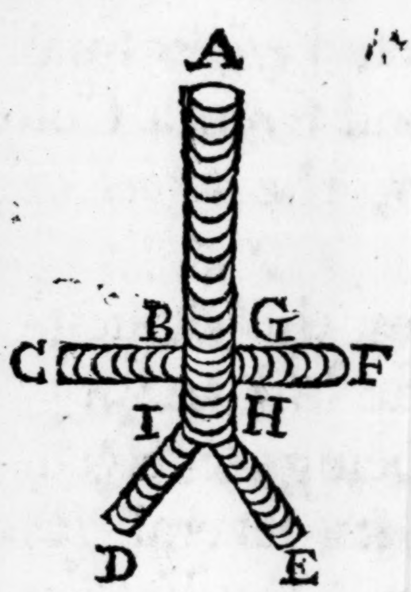
and

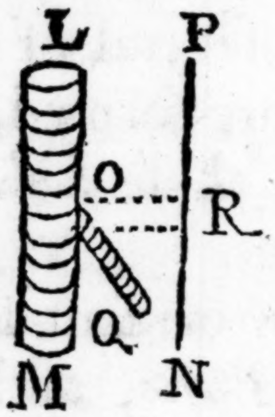
and bringing the *Cartilages* nearer to each other; when this happens in too great a Degree, a *Nervous Aſthma* is from thence produced.

This *Cartilaginous Fabric*, as being moſt *Elaſtic*, is very neceſſary to prevent a Suffocation, from any external Preſſure, to which this *Part* is ſo much ſubject. The *Trachæa* is not fixed to any *Part*, as moſt Anatomiſts aſſert, but is looſely connected, by which Means it is ſo eaſily capable of ſuch a Variety of Motion.

The *Pleura* which ſurrounds every Part of the *Thorax*, opens to admit, and give a Paſſage to the *Trachæa*, and then inveſts it likewiſe: When it deſcends as far as the *fourth Vertebra*, it is firſt divided into two *Branches*, and afterwards gradually into almoſt an infinite Number; the ſeveral *Ramifications* of the *Bronchia* go off at acute *Angles*, and the more they are extended, the more Acute theſe *Angles* are: The orbicular *Cartilages*, which in the Superiour Branches are connected by a thin Membrane, (differing much in us from thoſe in Brutes) become now compleat, tho' divided into diſtinct Proceſſes, that when there is an Occaſion they may admit of a greater Diſtention. As they are more extended they become gradually ſmaller; 'till at length they terminate in a fine Membrane, which is at the end of every Branch of the *Trachæa*, and by the Preſſure of the *Air* is formed into a ſphærical *Veſicle*. From a Collection of ſeveral of theſe *Veſicles* ſmall *Lobules* are formed, and from a Collection of theſe *Lobules*, the *Lobes* of the *Lungs*.

It is evident from the Structure of theſe *Parts*, and the known Properties of the Air, that being received into the *Trachæa*, and its ſeveral *Ramifications*, it will diſtend the *Veſicles* into a *Sphærical* Form, by which Means their mutual Contact will be diminiſhed; the *Orbicular Capacity*, and *Longitude* of the *Cartilages* will be increaſed; and the acute *Ramifications* will riſe into *Angles* approaching nearer to *right Angles*: This Alteration is moſt neceſſary; for by that Means a greater Quantity of Air is contained in a leſs Space than when their *Angles* were more *acute*; which may be thus demonſtrated. Let A. B. be the *Aſpera Arteria*, firſt divided into *Branches* C. B. and G. F. which conſtitute the ſuperiour *Lobes*, and into others I. D. and H. E. which conſtitute the inferiour *Lobes*. I ſay that theſe Angles





when the Lungs are inflated with Air, will be increaſed; for if L. M. is the Trunk from whence ariſes the Branch O. Q. let P. N. be drawn parallel to L. M. it is plain, from the 35*th Prop.* of the firſt Book of *Euclid*, that the *Parallelogram* O. R. is equal to any *Paral-*

Parallelogram, which is extended from L. M, to P. N. ſtanding upon the ſame, or an equal Baſis: But the *Parallelogram* O. Q. is not extended to N. therefore the nearer it approaches to O. R, the more Air may be contained in a leſs Space.

When theſe *Tubules* are therefore inflated with Air in *Inſpiration*, the ſeveral *Ramifications* recede more from each other, through the whole Subſtance of the *Lungs*, and their Angles become larger; by which Means the *Lobes*, with all their various Branches, are then more erected.

If the *Lungs* be placed in a *Vacuum*, and a Paſſage contrived to admit the external Air into the *Trachæa*, they immediatly become greatly diſtended; but that ſtill they reſiſt, and endeavour to contract, is moſt evident from hence, becauſe when the external Air is admitted, they inſtantly ſubſide; or if they be ſuſpended in the Air, they ſoon reduce themſelves into a ſmaller Space, than they poſſeſt in a human *Body*. This Contraction muſt be therefore owing to the natural Spring of the *Lungs*, not to the Air; for any *Body* ſuſpended in an *homogeneous* Fluid, ſuch as the Air, and receiving on all Sides an equal Preſſure, cannot from thence receive any Alteration of its Figure; and notwithſtanding this Reſiſtance of the *Lungs* (which is owing to the Spring of the *Cartilages*, and the Action of the *Meſochondrion Muſcles*, intermediate between them) is much leſs than the Preſſure of the Air; yet when, by the Aſſiſtance of other *Organs*, it is increaſed, and made ſuperiour to the diſtending Force of the Air, the *Lungs* muſt again unavoidably ſubſide.

From theſe Experiments, the manner how *Reſpiration* is performed in a human *Body* may be evidently demonſtrated.

That the Space between the *Lungs* and the *Pleura* is a *Vacuum*, and entirely void of Air, is ſufficiently manifeſt from hence; that the *Thorax* is perfectly formed in the *Womb*, and every Paſſage ſo exactly cloſed, that no external Air can afterwards gain admitmittance; and that the *Lungs* of an *Embryo* never receive any Air in the *Womb*, is plain, becauſe they are then always filled with Water, proceeding from the *Amnios*, which is not expell'd till the *Fœtus* paſſes through the narrow Streights of the *Uterus*, and *Vagina*; its *Thorax* being thereby greatly compreſſed; and on this Account the *Lungs* of an *Embryo* always ſubſide in Water, which Diſpoſition can never be procured to the *Lungs* of an *Animal*, which has once breathed, notwithſtanding the Air is drawn off by an *Air-Pump*.

From hence likewiſe it is evident, that whenever the external Air is admitted by a Wound into each Cavity of the *Thorax*, and gives a Balance to the Preſſure of the internal Air, the *Lungs* by the Aſſiſtance of their own contracting Force muſt immediately ſubſide; but if ſuch a Force be given to the Air entering the *Trachæa*, as might exceed the Preſſure of the external Air, the Animal may be ſtill kept alive, as (*a*) *Hook* by the following remarkable Experiment has demonſtrated. He opened the *Thorax* of a *Dog*, and with a pair of Bellows, and a Pipe, conveyed Air into his *Windpipe*; the *Heart* continued beating for a very long Time, after all the *Thorax*, and Belly had been opened; nay after the *Diaphragm* had been in great Part cut away, and the *Pericardium* removed from the *Heart*; and from ſeveral Trials made, it ſeem'd very probable, that this Motion might have been continued as long almoſt as there was any Blood left within the Veſſels of the *Dog*; for the Motion of the *Heart* ſeem'd very little changed, after above an Hour's Time, from the firſt opening the *Thorax*, though he found that upon removing the Bellows, the *Lungs* would preſently grow flaccid, and the *Heart* have convulſive Motions; but upon renewing the Motion of the Bellows, the *Heart* recovered its former Motion, and the *Convulſions* ceaſed. He likewiſe adds,

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(*a*) *Sprat*'s Hiſtory of the Royal Society. *Pag*. 232.

that tho' he made a *Ligature* upon all the great Veſſels, which went into the lower *Parts* of its *Body*, he could not find any Alteration in the *Pulſe* of the *Heart*, the *Circulation* it ſeems being performed ſome other Way. He could not perceive diſtinctly whether the *Air* did unite, and mix with the Blood, nor did he in the leaſt perceive the *Heart* to ſwell upon the Extenſion of the *Lungs*, nor did the *Lungs* ſeem to ſwell upon the Contraction of the *Heart*.

Whenever the Action of the *Intercoſtal Muſcles*, is ſtrong enough to overcome the Reſiſtance of the *Cartilaginous Segments*, (*a*) which joyn the Ribs to the *Sternum*, and perpetually reſiſt their Action, (by forming with them an acute Angle, which when the Ribs are elevated by the Action of theſe Muſcles, is forced nearer to a right Angle) the Capacity of the *Thorax* is thence greatly enlarged, a *Vacuum* is produced between the *Pleura*, and the *Lungs*,

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(*a*) Veſal. 1. *Cap.* XIX. *Fig.* 3. B E. C A E. *b*. *Fig.* 7. P. u. x. y. z. a.

and the *Preſſure* of the Air being greater than the *Reſiſtance* of the *Lungs*, diſtends them, till their *convex Superficies* is at Contact with the *Concave Superficies* of the *Pleura*; and the Reſiſtance of one, is exactly equal to the Preſſure of the other. But the Cauſes which produced this *Dilatation* of the *Thorax*, are thereby ſo weakned, that its longer Duration is prevented; and *Exſpiration*, or a *Contraction* of the *Thorax*, muſt unavoidably follow this full *Expanſion*; for in the full Point of *Inſpiration*, the Blood is ſo ſtrongly compreſſed in the *Lungs*, which are then in a State of Reſt, that it cannot paſs with the ſame Freedom as before into the left Ventricle of the *Heart*; whence the *Influx* of the *Nervous*, and *Arterial Fluid* into the *intercoſtal Muſcles*, and *Diaphragm*, being diminiſhed, the *muſcular Action* dilating the *Thorax* in ſome Meaſure abates of its Force; the *Æquilibrium* is deſtroy'd; the Spring of the Cartilages overcomes and depreſſes the Ribs, by which

Means the *Thorax* is contracted, and *Expiration* is performed.

The Action of the *Cartilaginous Segments*, joyning the Ribs to the *Sternum*, is the only *Antagoniſt* the *Intercoſtal Muſcles* have; for they always reſiſt the Force of theſe *Muſcles*, endeavouring to raiſe them, and make their Angles larger. This *Fabric* was abſolutely neceſſary, becauſe *Reſpiration* is ſucceſſive, and could not poſſibly be performed by *Antagoniſt Muſcles*; for, as ſuch, they muſt act alternately; but all the Nerves deſign'd for *Voluntary*, *Muſcular Motion*, have for the moſt *Part* the ſame Origine; and in the time of Sleep when *Reſpiration* is *Involuntary*, there is an *equal Influx* of Spirits into all the Nerves; and conſequently all *Muſcular Motion* muſt be then *equal*, not *ſucceſſive*; but theſe *Cartilages* perpetually retain their *Spring*, and Action, even in a dead Body; (and whenever the Cauſes that dilate the *Thorax* ceaſe to act, by their *Elaſtic Action*, it is immediately depreſſed, and contracted) and by this ſurprizing *Mechaniſm* this *perpetual Motion* is ſuſtained.

The *Heart* likewiſe is a *Muſcle*, whoſe Motion is *perpetual*, and *ſucceſſive*, while other Muſcles are ſometimes at Reſt, and ſometimes in Motion; and is ſo wonderfully contrived, that the ſame Cauſe which deſtroys its *Contraction*, reſtores its *Dilatation*; and each by this Means is mutually continued; for the *Conic Form* of the *Arteries*, and their *Muſcular Membranes*, ſupply the Place of an *Antagoniſt*; on which Account whenever the *Heart* by its Contraction expels the Blood into the *Aorta*, by the Reſiſtance which the *Conic Form* of this *Veſſel* gives to its Motion, it is repelled; and by that Means the *Coronary Arteries*, which are diſperſed through the Subſtance of the *Heart*, are repleniſhed with Blood, and its Nerves with Spirits, from the *Cerebellum*; (for no Obſtacle oppoſes) but at the ſame Moment the *Heart* is thus fully contracted, the *Auricles* are relaxed, and diſtended with Blood; by which Means the Cauſe of its Contraction immediately ceaſes; for the Motion of the *nervous Fluid*, that would otherwiſe continue to flow into the *Heart*, is now prevented by this Preſſure of the Blood in the diſtended *Auricles*; for as (*a*) *Lower*, and (*b*) *Willis* have demonſtrated, no Nerve arrives to the *Heart*, but what paſſes through the *Auricles*, ſo that when they are filled and diſtended, theſe *Nerves* muſt be *compreſſed*, and for that Moment (as when a Ligature is apply'd round them) the *Heart* muſt become *Paralytic* from the *Want* of a ſufficient Influx of *Animal Spirits*. Hence the *Auricles* no longer receiving any Oppoſition contract, and evacuate the Blood into the *Heart*, which eaſily yields to it, and becomes *diſtended*; and at the ſame time it receives this Blood, (by receiving likewiſe the *nervous Fluid* whoſe Motion is now free, and Blood into the *Coronaries*) it recovers a Capacity for a *ſucceeding Contraction*.

(*a*) *De Corde ſitû et ſtructurâ.* C. 1.
(*b*) *Nervorum deſcriptio et uſus.* Cap. XXIV.

Some have admired why the Motion of the *Heart*, and that of *Reſpiration*, is not performed in the ſame Space of Time; but it has been demonſtrated, that the Action of the former depends on the ſucceſſive Influx of the *Nervous*, and *Arterial Fluid* into the Subſtance of the *Heart*, and on the Influx of Blood into its Cavity, which laſt only is derived from the *Lungs*, and which are capable of containing ten times the Quantity of Blood, which the *left Ventricle* of the *Heart* can contain; hence in the full Point of Inſpiration when the *Lungs* are almoſt in a State of Reſt, and its *Arteries* are ſo compreſſed that the Blood cannot freely paſs into the Veins, the *Heart* is ſtill ſupply'd with Blood from the *Pulmonary Veins*, which according to the former Computation, contain a ſufficient Quantity to repleniſh the *Heart* five times. This is the Reaſon why, if the *Air* be ſtrongly retained in the *Lungs*, the Motion of the *Heart* is perceived very ſenſibly languid after the fifth *Pulſation*.

The Circulation of the Humours is quicker through the *Lungs*, than through any other Part of the Body, for as great a Quantity paſſes through them in the ſame Space of Time, as through all the other Parts of the Body; for all the *Arteries* receive their Blood from the *Aorta*, this from the left Ventricle of the *Heart*, and this from the *Lungs*; therefore if two ounces of Blood are expelled from the Heart at each Pulſation, the ſame Quantity muſt neceſſarily paſs through the *Lungs* in the ſame Space of Time, otherwiſe a fatal *Peripneumony* would ſoon ſucceed: Therefore if the *Heart* be ſuppoſed to contract ſixty times in a Minute, *three thouſand ſix hundred Ounces* of Blood (according to this Computation) muſt paſs through the *Lungs* in the Space of an Hour. And on this Account when the *Pulmonary Artery* is wounded, three or four Pounds of Blood are often evacuated in the Space of a Minute.

The *Pulmonary Arteries* receiving the *circulating Humours*, divide them into as many different Parcels, as there are *Ramifications*, whoſe Number is almoſt infinite; theſe minute Arterial Ramifications terminate in Veins, which by degrees uniting become larger, till at length they end in four large Branches returning from the four different *Lobes* which joining together, form the *Saccus Lowerianus*. By this Structure the Humours that were before ſeparated in the *Arteries*, are afterwards intimately mixed in the *Veins*: Hence (*a*) *Malpighius* affirmed that the chief Action of the *Lungs* conſiſted in *mixing* equally the *heterogeneous* Parts of the Blood, and that in a Drachm or any given Quantity of the *Fluids* which circulate through them, there will be a proportioned Mixture of the ſeveral Humours contained in the Blood. (*b*) *Borellus* oppoſing this Opinion of *Malpighius*, aſſerted that the Action of the *Lungs* conſiſted in *ſeparating* the *Humours*; the moſt exquiſite Separation being performed, when the *Blood*, or any

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(*a*) *Opera Anatom.* p. 325.
(*b*) *De Motu Animal. pars 2da. Prop.* 108. *et* 109.

heterogeneous Fluid, paſſes from a large Tube through ſmall Ramifications: But their Opinions tho' very different may be eaſily reconciled, being each of them partly right; for the circulating Humours by the *Structure* of the *Arteries* are *ſeparated*, and by that of the *Veins* are again moſt intimately *mixed* together; and by this uſeful Mechaniſm, the new *viſcid Chyle* received into the *Blood*, which otherwiſe would be apt to run into *Coheſions*, is attenuated, and all the circulating Humours are preſerved in a juſt Degree of *Fluidity*.

Theſe Advantages are likewiſe greatly promoted by the Preſſure of the *Air* on the Veſſels of the *Lungs* being ſo perpetually varied, that they never continue of the ſame Form, for two ſucceſſive Moments of Time: For in Inſpiration their Expanſion, and the Preſſure of the Air on them gradually increaſe, and in the ſame Proportion decreaſe in Expiration; and when the Air is retained in the full Point of Inſpiration, its increaſing Rarefaction ſtill continues the Change; and ſince the Capacity of theſe Veſſels is perpetually changed, the Figure of the Fluids muſt unavoidably admit of the ſame Alteration: And it is probable that by this Means the Humours paſs through, and are prepared in the *Lungs* for all the different *Secretions* which are afterwards performed in the whole Body, for all *Secretions* are made from the ſame *Blood*, and in a great Meaſure receive their different Properties from the different Capacity of the ſeparating Veſſels; and ſince theſe Veſſels from their greateſt Capacity, which is *circular*, are gradually compreſſed and changed into a *Plane* Figure, they muſt therefore likewiſe paſs through all the various intermediate Degrees.

It is evident from what has been laid down, that the moſt neceſſary Functions of the *Animal Oeconomy* immediately depend on the Influence of this *Organ*; and that likewiſe the *Heat*, *Colour* and the moſt *material Properties* of the *Blood* are chiefly owing to the *Lungs*.

For it is obſervable, that ſuch Animals who want Lungs, as Fiſhes, are al-

always *cold*, and the greater the Reſpiration (or the Action of the *Lungs*) is, the greater likewiſe is the Degree of Heat; for in a human Body the Force of Heat increaſes in Proportion to that of Attrition, and this to the Force of Circulation, which is as great through the *Lungs* as through all the other Parts of the Body: Hence in Regard to the Force of *Attrition* there is the greateſt *Heat*, but in Reſpect of the *Air* the greateſt *Cold*, the one is juſtly corrected by the other; for the Force of *Attrition* in theſe Parts is ſo very violent from the Preſſure of the *Air*, and the Velocity of the *Blood's Motion*, that Health could not long ſubſiſt if it was not thus *moderated* by a proper Diſpoſition of theſe Veſſels in being ſo much *expanded*, and by an *oppoſite Quality* in the Air.

For the *Refrigeration* of any Body, is proportioned to the *Expanſion* of its Surface, and the *Denſity* of the *Medium*, (as Sir *Iſaac Newton* has obſerved) and if any Body of a ſmall Surface, warmed to a great Degree, is extended into a large Surface, and placed in a *denſe Medium*, it will from that Alteration more quickly abate of its Heat, than otherwiſe; and for the ſame Reaſon the Heat of the Blood in the *Lungs*, muſt be much diminiſhed, and moderated, by being *expanded* on a large *Superficies*, and expoſed to the Influence of the Air, whoſe heat in the moſt warm Weather is leſs than that which is natural to a human Body, and by being renewed every Inſpiration, its *Denſity* is kept up in full Force; for that which is exſpired, by being *Rarified*, and warmed by the Heat of the Body, is not ſo capable of cooling the Blood if received again into the *Lungs*, as freſh Air.

Hence appears the Reaſon why Wind, which is only Air renewed, or a change of *Atmoſphere*, is ſo cooling (not that in Wind there is any thing actually more cold, than in any other Part of the ſame Air, for the moſt ſenſible *Thermometer* expoſed to the Wind of a large Bellows, receives from thence no Alteration) the circumambient Air being ſoon rendered by the Heat of human

man Bodies, more *light*, *rarified*, and conſequently leſs capable of *attracting* Heat from them, than ſuch Air as is placed beyond their Sphere of Activity.

Hence likewiſe appears the Reaſon, why the *Vital Heat* is more ſtrong, and laſting, in robuſt Conſtitutions than in others, their Humours being more *denſe*, and their *Veſſels* more *elaſtic*; and from thence not only capable of *exciting* a greater Heat, but of *attracting*, and *retaining* it longer than weaker Bodies; for tho' *Attrition* excites Heat, by *collecting* that *elementary Fire* which is diſperſed through every Part of Space, and tho' this *Collection* is proportioned to the *Elaſticity*, and *Velocity* of the Bodies in Motion, yet its *Retention* is always proportioned to the *Denſity* of Bodies.

(*a*) Sir *Iſaac Newton* in his *Opticks* ſuppoſes, that not only the *Collection*, but the *Retention* of Fire, or Heat in any Body, depends on the *oſcillatory Motion* of all the Parts of that Body

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(*a*) *Qu.* 5. *p.* 314. *pag.* 255.

which is warmed, he ſuppoſes likewiſe that there is an *attracting* Force between the *corporeal Subſtance*, and *Fire*, or the *Rays* of *Light*, and that when this Particle of *Fire* is in a perfect *Vacuum*, its Motion is very ſlow, but that the nearer it approaches to any Body, the more it is attracted by it, and its Velocity is increaſed in the ſame Proportion, which is always greateſt at the Point of *Contact*, from whence it is inſtantly repelled; that from hence an Action, and Reaction ariſe, which produce theſe *oſcillatory Motions*; and that the Force of Heat continues in Proportion to the Violence, and Duration of theſe *Vibrations*; he ſuppoſes likewiſe that theſe Rays of Light arrive to Bodies with an acute Superficies; but as theſe Notions were by no Means capable of a Demonſtration, and as this *great Man* was prevented from proſecuting them farther, he propoſes them to be inquired into, and examined by others; and after the moſt cautious Reaſoning on repeated Experiments, it appears that (notwithſtanding *elaſtic* Bodies are moſt capable of *collecting* Heat by *Attrition*, and that this is the chief Cauſe which excites Heat in a human Body,) this *Collection* of *Fire* in other corporeal Subſtances may be owing to other Cauſes: But whatever the different Cauſes are, which *determine* and *communicate* Heat to Bodies, it is always *retained* in ſuch Bodies, not in Proportion to their *Elaſticity*, but in Proportion to the *Quantity of Matter* and *Specific Gravity* of ſuch Bodies; for if *Gold*, *Mercury*, *Lead*, and *Water*, are placed in the ſame Degree of Fire, their different Heat will be exactly proportioned to their *different Denſities*; and no Bodies are certainly leſs capable than theſe two laſt, of exciting *Elaſtic Vibrations*.

The greater the *Denſity* of any Body is, the greater likewiſe is the Difficulty to *communicate* Heat to it, but when *communicated* it is the longer *retained*, whereas to Bodies of a reverſe Nature it is eaſily *communicated*, and as quickly goes off. This is the Reaſon why Perſons of a weak Conſtitution, from a ſmall Force of Heat are for a ſhort Space of Time immediately fluſhed, and warmed; for Weakneſs is Nothing elſe but a *Relaxation* of the *Solids* and a *Levity* in the *Fluids*.

Nothing is more wonderful, and perhaps more difficult to explain, than the Heat of the Blood in Animal Bodies; for the moſt violent Agitation of any other Fluid, is not capable of producing ſo great a Force of Heat; but whoever conſiders the following Reaſons will find them I believe ſufficient to account for it. 1ſt. The particular *Elaſticity*, and *Spring* of the *Solids* of *Animal Bodies*, their *Motion* perpetually changed, the *conic Form* of the *Arteries*, their *Ramifications*, the various Motions, and Repercuſſions ariſing from hence, muſt all produce a more exquiſite *Attrition*, than any Artificial Motion can poſſibly excite. 2*dly*. The *Animal Spirits* in ſeveral Parts of the Body mixing with the Blood, which from their Elaborate *Secretion*, their Surprizing *Activity*, and the Minuteneſs of their Parts, ſeem to be ſomewhat

what *Analogous* to the *Rays* of *Light*, or *Particles* of *Fire*. 3*dly*. The *Denſity* of the *Globules* increaſed by being compacted by the Action of the Veſſels, and their *Sphærical Form* containing the greateſt Quantity of Matter in the ſmalleſt Space, make them capable of *retaining* their Heat the longer. 4*thly*. By being *Oleaginous* they are apt to receive, and retain a greater Degree of Heat than other *Fluids*; for (*a*) Sir *Iſaac Newton* has obſerved, that there is a peculiar *Affinity*, and *Attraction* between *Heat*, or the *Rays* of *Light*, and *Oleaginous*, and *Sulphureous* Bodies. 5*thly*. This *Attrition* is performed in Veſſels where no col[illegible] *Medium*, ſuch as the Air, (or at leaſt only its more ſubtle Parts) can intervene; for any warm Body placed in a *Vacuum*, *retains* its Heat much longer than if expoſed to the open Air, (its *Medium* being much more fine than common Air) and if a perfect *Vacuum* could be obtained, it is probable that a *Denſe* Body

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(*a*) *Opticks p.* 250.

ſufficiently heated, would perpetually *retain* its Heat. This perhaps may be the Cauſe of the perpetual Heat of the *Sun*, which according to the beſt Computations, is the largeſt, and moſt Denſe Body, of a *Form* almoſt *Sphærical*, violently warmed, and agitated, and placed in a *Medium* which muſt from thence be moſt ſubtle, and fine.

The bright, purple *Colour* of the Blood, is chiefly owing to the *Lungs*, but not by admitting *nitrous Particles* with the *Air*, as *Lower* and others have imagined; for it does not appear that Air is received into the *Blood*, or that *Nitre* can be any way ſufficiently *Volatilized* to be univerſally mixed with the *Air*, and fit for this Purpoſe; for all *Nitre* is naturally a *fixed Salt*, neither by the Mixture of a *Volatile Alkaline Salt* (if it ſhould happen to meet with ſuch in the Earth) can it be rendered *Volatile*; for from thence it only becomes *Semivolatile*, and incapable of aſcending ſo high above the ſurface of the Earth, as is generally ſuppoſed; the *Volatile Spirit* of *Nitre* is likewiſe an artificial Preparation, and one of the ſtrongeſt Acids, and would be moſt pernicious to the *Lungs* if received into them: Neither does this Opinion receive any Force from the florid Colour which the Blood acquires by being mixed with *Nitre*; for *Salt Armoniac*, *Salt Gem*, or common *Sea Salt*, will give the ſame Tincture to it. But it is evident from the Diſcoveries which have been made with *Microſcopes*, that this Colour of the Blood is owing to the Action of the Veſſels on the contained Humours; for (*a*) *Leuwenhoeck* has given ocular Demonſtration, that ſix pellucid Globules of *Serum*, compacted, and joyned together, form a *red Globule*, whoſe Colour is loſt whenever they are ſeparated, and cannot be again reſtored by being mixed with *Nitre* or any of theſe *Salts*; and as the Preſſure of the Veſſels in the *Lungs* is greater on the circulating Fluids than in any other Part of the Body, the *Globules* that were before ſeparated or imperfectly joyned together,

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(*a*) *Tom.* 2. *p.* 3.

are thereby compreſſed, and moſt exactly united; and from thence the Colour of the *Blood* returning into the left *Ventricle*, is much more bright, and florid, than in the *right Ventricle*, before it received the Action of the *Lungs*.

Whatever is the different Nature of the Food received into the *Stomach*, the *Chyle* or *Milk* made from thence is always of a *white* Colour; and when more perfectly elaborated by the Action of the *Veſſels*, and the Mixture of the other *Animal Fluids* is changed into a *red* Colour. This particnlar Alteration may in ſome meaſure be illuſtrated from chymical Experiments made on *Milk*; for if this is mixed with any thing of an *Alkaline* Nature, and gradually agitated with a ſufficient Degree of Heat, it aſſumes a *yellow* Colour, and from thence paſſes through various Degrees, till at length it becomes intenſely *red*: And if the Heat be farther increaſed, it is changed into a *dark* Colour. Thus in a human Body, the *Chyle*, and *Milk*, by being mixed with the other Animal Fluids, which are of an *Alkaleſcent* Nature, tho' not *Alkaline*, and by being prepared by more juſt Degrees of *Heat*, and *Preſſure*, are changed into a *yellow Serum* and at length into *Florid Blood*: On this Account a *Sanguine* Complexion is almoſt peculiar to ſuch who uſe much Exerciſe; while they who lead an inactive Life generally look *pale*; and in hot Countries, the Complexion of the Inhabitants is *dark*, and Aduſt, their Solids being parched up, and their Fluids agitated with a ſtronger Force of Heat than in a more moderate Climate.

The Opinion of the Air being received into the Blood, has very much prevailed, notwithſtanding there are ſeveral Arguments which ſeem ſufficient to prove the contrary. 1*ſt*. The external Membrane that receives the immediate Contact of the Air, is lubricated with a mucilaginous, unctuous Humour, and ſuch as Mr. *Boyle* has demonſtrated, with the greateſt difficulty admits the Air to paſs through it, (*a*) and Water which ſeems to be a more ſubtle Body, will enter through Pores which are impervious to Air. 2*dly*. Every Part of the *Lungs* ſeems to be carefully guarded againſt its Admittance, for it cannot enter through the Arteries, becauſe the repreſſing Force of the circulating Fluid in theſe *Veſſels*, is greater than the preſſing Force of the Air; for no Fluid (as the Doctrine of Hydraulics demonſtrates) can enter a *Veſſel* repleniſhed with another Fluid, where the Reſiſtance of one, is greater than the Preſſure of the other; and the Veins are ſo compreſſed every Inſpiration, that no Admittance can be then expected of another *Fluid*, and in Expiration the preſſing Force of the Air is directed a contrary Way; beſides if the Air could obtain a Paſſage into the Veins, it muſt enter through every Veſicle, ſince one has not a more particular Privilege of admitting it than another, but as

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(*a*) *Lib*. 2. *chap*. 13.

the Number of theſe is almoſt infinite, it muſt unavoidably follow, that in the *Sinus Lowerianus* where they all terminate, there muſt be a very conſiderable Collection of Air, and being there agitated with the Blood, Bubbles muſt be thence excited; but nothing of this Nature can be obſerved with the beſt Microſcopes. (*a*) 4*thly*. If Air be injected into the *Veſſels* of any *Animal*, it ſoon proves fatal: It ſeems therefore improbable that the common groſs Air, can be admitted into the Blood through the *Lungs*; and the Advantage which (*b*) *Borellus* aſſigns to the Blood, from the intermediate Poſition of the particles of Air between the Globules of Blood, producing an *Oſcillatory*, *Elaſtic* Motion, may be more juſtly explained from the Particles of Fire, which penetrate, and enter all Bodies both ſolid and fluid, which are thereby rarefied in Proportion to the Quantity of Heat, and the different Denſities of ſuch Bodies; and as it can be

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(*a*) *Leuwenh. Op. Tom.* 2. *p.* 37. 214.
(*b*) *De Motu Animalium. pars 2da. prop.* 115.

demonſtrated, that the Force of Heat is ſcarce the ſame in any Part of Matter for two ſucceſſive Moments of Time, it evidently follows, that not only in the Blood, but in all other Solids, and Fluids, there muſt be a *perpetual Oſcillatory*, *Periſtaltic* Motion.

Thus I have endeavoured to give a ſhort, and accurate Account of the *Lungs*, deduced from the Anatomical Structure of the Parts, the Preſſure of the Air, and the Properties of the circulating Humours; and from thence likewiſe may be explained the *good* and *bad* Effects of Air, which are obſervable in Pulmonary diſorders, from the different Alterations of its *Gravity* and *Elaſticity*; and what Air is moſt ſuitable to *conſumptive Conſtitutions*.

The *Gravity* of the Air, when too much increaſed becomes pernicious, not that *Reſpiration* is thereby prevented, for in that Reſpect it may be performed where there is the greateſt Exceſs of Gravity, becauſe the Preſſure is every where equal, the Force of the external Air preſſing the *Thorax*, being

ing equal to that of the internal Air diſtending the *Lungs*; but the Inconvenience proceeds from the Exceſs of its Weight on the Veſſels, which are by that Means ſo compreſſed, and their Reſiſtance made ſo great, that the *right Ventricle* of the *Heart* cannot propel the Blood through the *Lungs*, whence a fatal *Peripneumony* muſt ſoon enſue; but it ſeldom happens that the Gravity of the Air is ſo far increaſed, except from ſome Poyſonous Vapours, as to produce theſe bad Effects.

A *heavy* Air is moſt proper for ſuch, whoſe Fibres are too much relaxed, and whoſe Fluids are too much diſſolved, (which is generally the Caſe of moſt conſumptive Conſtitutions) and particularly for ſuch *Aſthmatic* Perſons, whoſe Diſorders proceed from *Spaſmodic* Contractions of the *Meſochondrion Muſcles*, which by this increaſed Preſſure are kept more forcibly diſtended; and who on this Account are always obſerved to breathe more freely in ſuch an Air: Therefore ſuch Perſons ought always to chooſe a *Serene* Air in a *low*, *dry*, *ſandy* Soil with an *open* Situation; for the moſt *Serene* Air, as it appears by the *Barometer*, is moſt *heavy*, its Spring being then not weakned by the Interpoſition of Aqueous Particles; in the next Place the Preſſure of the Air is, *cæteris paribus*, as the Altitude of the ſuperincumbent Column of Air, and *Marriote* (*a*) has obſerved, that if a *Barometer* be carried up to the Top of a very high Tower, the *Mercury* gradually ſubſides, till it is reduced only to the Weight of twenty four or twenty five Inches, as being then preſſed by a ſhorter Column, and conſequently a leſs Quantity of Air; and if it is carried down into a very deep Cave, or Mine, it gradually riſes, as being ſucceſſively preſſed by a greater Quantity of Air. And (*b*) *Graveſend* has ſhewn this Alteration to be ſo conſiderable, that the *Mercury* ſubſides a quarter of an Inch in the *Barometer* by being carried a hundred Yards higher

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(*a*) *Du Mouvement des Eaux. p.* 2, *diſcours.* 1.

(*b*) *Introduction to Sir.* Iſaac Newtown's *Philoſophy. Part.* 2. *p.* 211.

in the ſame Air; a *dry* Soil is moſt proper becauſe ſuch exhales the leaſt Quantity of Vapours, which are greatly prejudicial, not only as they diminiſh the Spring of the Air, but as they increaſe the Relaxation of the *Veſſels*.

Such a Situation tho' moſt eligible, is very difficult to obtain, for *low* Situations are generally *moiſt*, and *confined*, by which Means the Advantages thence propoſed are prevented, and are commonly attended with greater Inconveniences than *higher* Situations, which are ſo remarkably healthy, and ſo much eſteemed, becauſe the Circulation of Air is more open and unconfined, and the full Vigour of its *Spring* is preſerved in being ſo free from *Vapours*.

The *Levity* of the Air increaſed to a great Exceſs, is immediately pernicious, becauſe its Force is not then ſufficient to overcome the natural *Contraction* of the *Lungs*: The nearer it approaches to this Diſpoſition, the more improper it is for ſuch to whom a heavy Air is neceſſary; hence on the

Top of high Mountains ſuch Perſons are often apt to ſpit Blood, their Veſſels being weak, and their Humours moſt eaſily rarefied from the Want of a ſufficient Preſſure. A *light* Air is moſt proper to ſuch whoſe Humours are condenſed, and Fibres contracted, who in a *heavy* Air are particularly ſubject to *Inflammatory* Diſorders.

Hence likewiſe it is evident, how *Heat* or *Cold* by altering the diſpoſition of the Air affect the *Lungs* of conſumptive Perſons, as by the former it is always *rarefied* and by the latter *condenſed*.

The Air by being rendered *moiſt* becomes leſs *elaſtic*, and incapable of penetrating into the fineſt Receſſes of the *Lungs*, whence the *Veſſels* are unequally diſtended and relaxed, and the Humours thereby leſs compacted: Hence Perſons of a lax and leucophlegmatic Habit of Body are in ſuch a Conſtitution of Air particularly ſubject to moiſt Coughs and Defluxions; the *Pulmonary Veſſels* at that time being apt to receive a greater quantity of Humours from their Reſiſtance being diminiſhed, and from their Relaxation being increaſed, are leſs capable of propelling them.

A *dry* Air is ſubject to the ſame Advantages, and Inconveniences which proceed from an Increaſe of its *Gravity*; the ſame Effects are produced from different Cauſes; by the *former* the *Veſſels* are made narrow from the Preſſure on them, by the *latter*, from their own *contraction* which is always diminiſhed by a relaxing lubricating Moiſture.

Whoever adds to what is here mentioned, the Inconveniences which attend *Perſpiration* being increaſed, or diminiſhed by theſe Alterations, may eaſily account for the ſeveral Diſtempers which proceed from the *various Seaſons* of the Year, and *Changes* of the Weather, all which the *Divine Old Man* (*a*) has moſt accurately deſcribed.

(*a*) *Lib.* 1. *Aphoriſm.*

PART the III.

OF A
CONSUMPTION
OF THE
LUNGS.

A *Conſumption* of the *Lungs*, is a Waſting of the Solids, and a Corruption of the Fluids, proceeding from a Collection of *purulent Matter* in theſe Parts.

Several Diſeaſes which proceed from the ſame Cauſes, differ only in their ſituation; and the moſt certain Method of attaining to a Knowledge of *internal Diſorders*, is by comparing them with ſuch as are *external*, and of the ſame Sort; therefore the Obſcure Nature and Origine of *internal Ulcers* may be moſt rationally explained, from the ſenſible Cauſes of ſuch as are *external*; all which may be reduced to whatever Cauſe produces ſuch a *Stagnation* of the *Humours*, as muſt *obſtruct*, *inflame*, and then *ſuppurate* the Veſſels; or to whatever *diſſolves* their *Continuity*, of which a *Suppuration* is the unavoidable Conſequence; In this laſt Caſe an *Ulcer* is performed without any preceding *Obſtruction*; in the former 'tis the *Conſequence* of it; and tho' the ſame *Effect* is produced from different Cauſes, the Indications of Cure in the firſt *Stage* of this *Diſtemper* are very different, and even in the laſt *Stage*, tho' the *Symptoms* are then the ſame, ſome Regard is to be had to the firſt Cauſe, which has laid the Foundation of this Diſorder.

From hence it appears, that the only Way to have an exact Notion of a *Phthiſis* of the Lungs, and the various Cauſes of it, and the Method of Cure, is to conſider it as proceeding from previous *Obſtructions* of the Veſſels, or from a *Solution of their Continuity*: For theſe Effects are produced from the ſame Cauſes in the Veſſels of the Lungs, and on the Surface of the Body; for the Sharpneſs of an Inſtrument, and the Force given to it, which produce an external Wound, are exactly ſupplied in an internal *Hæmoptoe*, by too great a *Momentum* given to *acrimonious Fluids*.

As this ſeems to be the moſt natural *Diviſion* of this Diſtemper, I ſhall therefore endeavour to account for its various *Origine* and *Progreſs*, ſo far as it relates to any Cauſe which in general diſpoſes the *Humours* to *form Obſtructions*, and peculiarly *determines* them to the *Lungs*; or to whatever gives the Humours ſuch an *Acrimony*; and the *Pulmonary Veſſels* ſuch a *Tenderneſs*, as muſt if increaſed, *diſſolve* their *Continuity*.

nuity. From the Neglect of obſerving this regular Method, ſuch confuſed Notions have been delivered of this *Diſtemper*, and Medicines of a contrary Nature ſo much commended by various Authors: But this Difference from hence may be evidently explained, and reconciled; for what is uſeful in one *Sort*, or *Stage* of this Diſeaſe, may eaſily prove deſtructive in another.

All *Obſtructions* proceed from this general Cauſe, that the *Globules* of the *Humours* are larger than the *Capacity* of the tranſmitting *Veſſels*; which is owing either to a Fault in the *Fluids*, (in being too *viſcid*;) or *Solids*, (in being too *narrow*;) or to *both* Cauſes.

(*a*) It is moſt evident from repeated *Experiments*, and *Obſervation*, that the *Humours* in a human *Body* acquire a *Viſcidity* (tho' of a different Nature) which gives them a leſs Aptitude for Motion, either from *too great Coldneſs*; or a *Circulation too languid*; or from *Heat* and *Motion too great* and *intenſe*;

(*a*) Vid. pag. 34.

or from a *Mixture* of any *viſcid Humour*; or of ſuch as diſpoſes them to a *Coagulation*.

While the *Humours* are preſerved in a juſt Degree of Heat, and Motion, they continue moſt perfectly attenuated and fluid; but when they are entirely deprived of the Benefit of *Circulation*, the finer Parts ſoon become viſcid, and the groſs Parts coagulated; therefore when an *inactive Life*, or any *internal Cauſe*, (by giving too great a Relaxation to the *Veſſels* and *Bowels*,) prevents a ſufficient Heat and *Circulation*, they will in Proportion acquire a *glutinous* Diſpoſition, and thence become more apt to form *Obſtructions*.

Perſons thus prediſpoſed, are in the greateſt Danger, when this *Viſcidity* of the *Fluids* is encouraged, and determined to the Lungs, by a *moiſt*, *cold Conſtitution of Air*; hence *Coughs* have been generally obſerved to be Epidemic at ſuch a Seaſon, (*a*) and immediately after froſty Weather, when the Thaw

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(*a*) *Hippoc.* lib. 3, *Aphoriſm.* 13.

begins; for then (as it appears by the *Mercury* ſubſiding in the *Barometer*) the Gravity of the Air being greatly diminiſhed, the *Humours* from the want of a ſufficient *Preſſure* in the *Lungs*, become leſs attenuated, and acquire a greater *Viſcidity*; which is likewiſe encouraged by the *Coldneſs* of the Seaſon, and the univerſal *Relaxation* of the *Veſſels*, which the ſame *Diſpoſition* of Air brings on: In this Condition of the *Humours Perſpiration* will ſoon be diminiſhed; not from a *Contraction* of the *perſpirable Pores*, as is commonly ſuppoſed, but from this *Viſcidity* of the *Humours*; for (*cæteris paribus*) this *Evacuation* is always proportioned to their *Velocity*, and *Fluidity*; both which are in this Caſe deficient. From the ſame Cauſe the other *Secretions*, which are performed in the minute *Veſſels*, and therein moſt eaſily obſtructed, will be likewiſe diminiſhed: Hence the Machine becomes perpetually more loaded, and the whole *vaſcular Frame*, by being diſtended beyond its uſual Tone, is *irritated* and *ſollicited* to a Diſcharge;

which, according to the Laws of Fluids, will always happen where there is the leaſt Reſiſtance; by which means, the *Lungs* of Perſons, thus prediſpoſed, muſt be unavoidably *oppreſſed*, and *obſtructed*, as they receive a greater Quantity of ſuch *viſcid* Humours than uſual; from their *Reſiſtance* being *diminiſhed*; and from the ſame Cauſe, are leſs capable of attenuating and propelling them.

Hence *old Men* are particularly ſubject to *Catarrhs*, and *pituitous Obſtructions* in the *Lungs*; for in ſuch the Force of Circulation being very languid, their Humours thence acquire this *cold Viſcidity*; and from the ſame Cauſe, not being determined with ſufficient Force to the Surface of the Body, are more apt to be diſcharged by theſe Paſſages: Tho' to ſuch Perſons a *Cough* is ſeldom dangerous, their Veſſels being firm, and compacted; but more frequently becomes neceſſary, and ſerviceable to them, and by ſupplying the Place of Perſpiration, and other obſtructed Outlets, diſcharges ſuch Humours, as would otherwiſe be quickly fatal to them.

The *Humours* may likewiſe acquire a *Viſcidity* from any Cauſe which gives them a *greater Heat* than is natural to them, or which *diſſipates* the *finer Parts*, and leaves the *groſs* behind; ſuch as *hard Exerciſe*, *Drinking of ſpirituous Liquors*, *profuſe Sweats*, &c. The Nature of this *Viſcidity* is very different from the former, which proceeds from oppoſite Cauſes, and is generally attended with a ſoft, flaccid, Habit of Body, a weak, ſlow Pulſe, *Urine* pale, an Abſence of *Thirſt*, and all the *Symptoms* of a languid *Circulation*; whereas ſuch who have a *Prediſpoſition* to this *Viſcidity*, have their *Fibres* more braced, and contracted; their *Pulſe* ſtronger, and quicker; their *Urine* more high coloured; and are moſt particularly ſubject to Obſtructions in the *Lungs*; when this Diſpoſition of the *Humours* is encouraged, and determined to the *Lungs*, by being expoſed to any *external Cold*, or by a ſuitable Conſtituſtitution of *Air*; ſuch as *froſty Weather*, and when *Eaſt*, or *North Winds* blow, which as *Hippocrates* (*a*) obſerves, likewiſe make theſe Diſorders *epidemic* to ſome Conſtitutions; for the ſame Diſpoſition of Air, which by checking *Perſpiration* frequently determines the *Humours* to the *Lungs*, makes their *Veſſels* more apt to be *obſtructed*, by giving them a greater *Narrowneſs* than is natural to them: In ſuch Conſtitutions, the *cutaneous* Diſcharge is not only apt to be diminiſhed by the *Viſcidity* of the *Fluids*, but by the *Contraction* of the *perſpirable Veſſels*; by which means the *Quantity* of Humours being increaſed, (*b*) their Motion and Heat, and conſequently their *Viſcidity* will increaſe in the ſame Proportion; for the *Globules* of the *Humours*, from this increaſed Heat, and Preſſure of the *Veſſels* on them, become compacted, and preſſed together, and adhere with a larger Superficies; and their *ſphærical Form* being thereby changed,

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(*a*) *Lib.* 3. *Aph.* 5.

(*b*) *Bellini de febribus. Prop.* 2*da* they are leſs capable of paſſing through the *minute Tubes* of the *Lungs*; ſince, by that Alteration, they take up a larger Space than before. And that ſuch is the Diſpoſition of the *Humours* from this *Viſcidity*, is moſt evident from Obſervations by Microſcopes.

In this Condition of the *Humours*, the *Veſſels* of the *Lungs* are thence apt to be obſtructed, either that the *univerſal Viſcidity* of the Fluids renders them more unfit for Motion, or that by their *increaſed Velocity* ſome *Globules* are forced into the decreaſing Series of *Veſſels*, to which they do not properly belong: For as the *Capacity* of the larger *Veſſels* increaſes in Proportion to the Preſſure, and Motion of the circulating *Fluids*, the lateral *Orifices* of the *ſerous Arteries*, which take their Origine from them, muſt unavoidably admit of the ſame Alteration; and be then capable of admitting red *Globules* to enter, which cannot ſo eaſily paſs through, but are thence apt to form Obſtructions, as the *Diameter* of theſe *Veſſels* from their *conic Form* continually decreaſes.

From the ſame Cauſe the minute *Lymphaticks* that take their *lateral Origine* from the *ſerous Arteries*, and the other *decreaſing Series* of *Veſſels*, are liable to *Obſtructions*, from *Globules* of *Serum*; or of a *ſuperiour Series* being forced into them.

Obſtructions of this Nature are more eaſily produced, if Perſons thus prediſpoſed be ſuddenly expoſed to *Cold*; which not only contributes to bring on theſe Diſorders, as it determines the *Humours* with greater Force to the *Lungs*, by ſuppreſſing *Perſpiration*, but the Veſſels likewiſe from the ſame Cauſe receiving a ſudden *Contraction*, more firmly retain the obſtructing *Globules*, which might otherwiſe repaſs, or get through, if the Blood were kept warm, and the Veſſels ſufficiently dilated for ſome time, or by degrees recovered their former Contraction and Capacity.

The *Humours*, tho' otherwiſe rightly conſtituted, and in a proper Degree of *Fluidity*, may be altered and diſpoſed to form *Obſtructions*, by the Mixture of *viſcid indigeſted Chyle*; this will happen when the *Organs* of the *firſt Digeſtion* are impaired, and not capable of converting the *Aliment* into laudable *Chyle*; or when from a peculiar Weakneſs of the *Organs* of the *ſecond Digeſtion*, it is not ſufficiently attenuated, and elaborated into *Serum*, but ſtill retains a *chylous Viſcidity*.

The inconvenient Effects of this unprepared Viſcidity of the *Chyle*, will be firſt perceived in the *pulmonary Veſſels*, where by the known Laws of *Circulation* it is quickly conveyed almoſt unchanged, and is generally more apt to form *Obſtructions* than any other *Humours* in the *Body*, for theſe are greatly attenuated, and made more fit for Motion, having already circulated through the ſmalleſt *Capacity* of the *Arteries*; whereas the *new Chyle*, when firſt received into the *pulmonary Veſſels*, is as yet unfit for ſuch narrow Paſſages, and moſt diſpoſed to form *Obſtructions*, eſpecially when unprepared, and attended with a greater *Viſcidity* than uſual. This *Indigeſtion* is the moſt common Cauſe of *Obſtructions* in the *pulmonary Arteries*, attended in the Beginning with a *dry Cough*; and to which ſuch as lead a ſedentary, ſtudious Life are particularly ſubject; for whoever conſiders what has been delivered in the former *Theory*, will eaſily conceive, that notwithſtanding our Food is exactly prepared in the firſt Paſſages, how neceſſary Exerciſe is, eſpecially in weak Conſtitutions, to give a ſufficient *contractile Force* to the *Veſſels*, and particularly to thoſe of the *Lungs*, that the *Chyle* might acquire a juſt Degree of Fluidity, and be at length aſſimilated into *Serum*.

The *Veſſels* of the *Lungs*, may be diſpoſed to form *Obſtructions*, by whatever renders their *Capacity* too narrow; This may likewiſe be produced by various Cauſes; ſuch as an *irregular Motion*, or too great an *Intenſeneſs* of the *Animal Spirits*, any *internal Acrimony* of the *Fluids*, which ſtimulates, and draws the Solids into greater *Contractions*; or by any *external* Cauſe *compreſſing*, and *irritating* the Veſſels; ſuch as *arſenial* and *mercurial Steams*; a *bad original Formation of the Thorax*; for which conſumptive Perſons are often remarkable; for this Reaſon Coughs almoſt conſtantly attend Children ſubject to the *Rickets*, the Cavity of the *Thorax* in that Diſtemper being much contracted from the irregular Form, and Depreſſure of the Ribs, and from the *Diaphragm* being forcibly preſſed up by the Largeneſs of the *Liver*.

Hence it appears that ſeveral previous, *acute*, and *chronic* Diſorders, by either giving an *inflammatory*, or a *languid Viſcidity* to the *Humours*; or by affecting the *Solids*; might contribute to bring on theſe *Obſtructions*; eſpecially when determined to the *Lungs* by a ſuitable Diſpoſition of Air: And from hence may be eaſily underſtood the Nature, and various Origine of that *Conſumption* which is termed *Symptomatical*.

Hence likewiſe it appears that different Extremes in the Alteration of the Air, (*a*) in being either too *moiſt*, or

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(*a*) Vid. Pag. 106, ad 111.

too *dry*; too *hot*, or too *cold*; its *Gravity* or *Levity* too much increaſed, will by rendring the Veſſels too much *contracted*, or by diſpoſing the *Humours* to become *Viſcid*, greatly contribute in Conſtitutions variouſly prediſpoſed, to bring on, and particularly determine theſe *Obſtructions* to the *Lungs*.

Some Authors are of Opinion that this *Diſtemper* is *contagious*, but have not rightly conſidered in what particular Caſes only, and after what Manner it may prove ſo: For it cannot be communicated but from one in the laſt Stage of a *Phthiſis*; neither then is the Contagion ſo ſudden as in acute Diſeaſes, but requires a longer time to exert its Malignity; and generally a peculiar *Prediſpoſition* in the Perſon that receives it: But when theſe Circumſtances concur with ſufficient Force, 'tis moſt certain from undeniable Inſtances, that the Infection may be eaſily communicated, neither is the Reaſon of it very obſcure; for by frequently lying with one in the laſt *Stage* of this Diſtemper, the ſoundeſt *Lungs* may be at length as effectually tainted, and the beſt diſpoſed *Humours* rendered *Acrimonious*, as by lying in, and breathing a *Putrid Atmoſphere*; and 'tis moſt evident from repeated Experiments, that the *Abſorbent Veſſels* are capable of conveying a conſiderable Quantity of *Humours* into the Blood; eſpecially when Sleep, and the Warmth of the Bed, by increaſing their Relaxation, gives them a greater Aptitude to receive them; at the ſame time the Phthiſical Perſon commonly diſcharges by Sweat the greateſt Quantity of the moſt noxious, and acrimonious Parts of the *Humours*; and in ſome Caſes the ſteams ariſing from *malignant Ulcers*, or a *Cancer*, and immediately inſpired with the Air into the *Lungs* of another, might after the ſame Manner as *arſenical Effluvia* be apt to irritate, obſtruct, and erode their tender *Veſſels*.

The Symptoms, and various conſequences of theſe Obſtructions thus formed in the *Lungs*, are varied according to the *different Cauſes*, *Seat*, and *Duration* of the obſtructing *Humours*.

The more complicate the Cauſes are which produce theſe *Obſtructions*, the greater is the Danger, and Violence of the *Symptoms*; thus *Obſtructions* are frequently owing to a *general Viſcidity* of the Humours, and an *indigeſted Chyle*; for a Defect in the latter, is apt to bring on univerſal Diſorders of the *Fluids*; and an Indigeſtion may be likewiſe owing to previous Diſorders in them; but tho' one Diſorder is often the Conſequence of the other; yet the original Cauſe is chiefly to be regarded, and may be eaſily diſtinguiſhed, as the bad Effects of *Indigeſtion* are in the beginning perceivable in the firſt Paſſages, but of a general *Viſcidity* in the *Fluids*, in the more remote-ſcenes of Action: When an eroding *Acrimony* is joyned with the *Viſcidity* of the *Humours*, and the Veſſels from any internal Cauſe, or from an original bad Formation, are *narrow*, and *tender*, the Danger is in proportion increaſed: Thus perſons of a weak Conſtitution, that lead a Sedentary, ſtudious Life, have not only a Diſpoſition, to form Obſtructions from an indigeſted *Viſcidity* of the *Chyle*, but all the other *Humours* from the ſame Inactivity are apt to acquire a *Lentor*, and from the *Intenſeneſs* of their *Spirits* have frequently thence a peculiar *Narrowneſs* in their *Veſſels*.

The ſeat of theſe Obſtructions is either in the *Pulmonary*, or *Bronchial Veſſels*, and their *Lymphaticks*.

Obſtructions, formed in the *Bronchial Arteries* are leſs dangerous than in the *pulmonary Arteries*, and attended with different Symptoms; for as the Extremities of the *Bronchial Arteries* terminate in Glands, which are diſperſed through the *Trachæa*, and its various *Ramifications*, Obſtructions formed in them are thence generally attended with a moiſt, *pituitous Expectoration*, difficult Breathing, and apt to make a wheezing Noiſe: Perſons thus affected complain in the Beginning before *Expectoration* is free, of a tickling *Diſtillation* on the *Breaſt*; (different from that which proceeds from an *Irritation* of the *Glands* placed about the *Larynx*.) This Senſation is cauſed by a thin, acrimonious *Humour*, ouzing through the obſtructed *Veſſels*, which being *tenſe*, and by frequent Coughing deprived of their defending *Mucus*, are thereby eaſily *irritated.*

Obſtructions formed in the *Pulmonary Arteries*, can never be relieved by *Expectoration*; (unleſs after a *Suppuration* or an *Hæmoptoe*;) for as they have no other Termination but into the *Pulmonary Veins*, they can only be carried off by a *Reſolution*: Hence they are always attended with a *dry Cough*, a difficult *Reſpiration*, but without any *Wheezing*, a conſtant *Oppreſſion*, and an *obtuſe Pain*, which is perceivable in a full *Inſpiration*: Theſe are Symptoms of what we call *Tubercles*: And when the larger *Ramifications* of the *Pulmonary Artery*, near the Heart, are compreſſed by theſe *Obſtructions*, they are frequently attended with an unequal, and an intermitting *Pulſe*.

The *Seat* of theſe *Obſtructions* may be likewiſe more particularly known, by the Force of the *Cough*, and the Manner of *Expectoration*: Thus when the *Glands*, placed about the Origine of the *Trachæa*, are obſtructed, and irritated, a ſimple *Catarrh*, and what is commonly called a *Diſtillation* is only thence produced: The uneaſy *Irritation* is firſt perceived in the *Parts* affected, and the *Expectoration* of the concocted *Phlegm* is performed with a *Hawk*, or a *ſmall Cough*; but when the Seat of theſe *Obſtructions* is in the *Lungs*, the Irritation is then perceived deeper, and the *Expectoration* is in Proportion more profound: Notwithſtanding in this laſt Caſe, the *Glands* of the *aſpera Arteria* will at length be abraded by frequent *Coughing*, and an uneaſy Senſation likewiſe produced in them; whence the *Cough* becomes more frequent, and violent; and on the contrary, the *Lungs* by frequent Coughing, excited from previous Obſtructions in theſe *Glands*, being agitated and weakned, are at length apt to be affected after the ſame Manner.

Obſtructions formed in the *Pulmonary*, or *Bronchial* Arteries, receive a quick Increaſe from the ſame Cauſes that

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(*a*) *T. m.* 2. *Epiſt.* 67. *pag.* 205, 206, 207, 208. *Tom.* 3. *Epiſt.* 119.

firſt produced them; (*a*) *Leuwenhoek* plainly obſerved this Progreſs in the bruiſed Wings of a *Bat*, and in the Tail of a young *Frog*, and that the coagulated *Globules* obſtructing the Extremities of the *Veſſels*, if not removed by the propelling Force of the circulating Humours, received from thence a conſtant Addition, while the more fluid *Parts* either ouzed through the obſtructed *Veſſels*, or entered the *lateral Veſſels*, and the more groſs remaining, not only added to the *obſtructing Matter*, but by preſſing on the neighbouring *Veſſels*, diſpoſed them likewiſe to form *new Obſtructions*.

Hence *Obſtructions* of the *Bronchial Arteries* are apt at length to produce Obſtructions of the *Pulmonary Arteries*, and *vice verſa*; for being equally ramified through the Subſtance of the *Lungs*, when the *Veſſels* of either are much obſtructed and diſtended, by preſſing on the other they eaſily diſpoſe them to form Obſtructions; hence in the Progreſs of this *Diſtemper*, the *Symptoms* are variouſly altered, and increaſed;

creaſed; a *dry Cough* proceeding originally from *Obſtructions* of the *pulmonary Arteries*, being often at length attended with a moiſt, *pituitous Expectoration* from the *Bronchial Veſſels*; and from Obſtructions firſt formed in the *Bronchial Arteries*, latent Obſtructions, and *Abſceſſes* in the *Lungs* have been at length produced.

Theſe *Obſtructions* if not reſolved, according to their various Nature, and Diſpoſition, have a different *Termination*.

Obſtructions formed in the *pulmonary Arteries*, from an *inflammatory Viſcidity*, joyned with an *Acrimony*, a quick Circulation, and a Tenderneſs of the *Veſſels*, ſoon terminate in a *Peripneumonic Fever* and thence a *Suppuration*: Whereas *Obſtructions* formed from a more languid *Viſcidity*, when attended with a *ſaline Acrimony*, and a ſlow *Circulation*, have that *Termination* from a more gradual *Eroſion* of the *Veſſels*.

Obſtructions formed in the *Bronchial Arteries*, where the *Humours* are naturally *acrimonious*, or acquire that Diſpoſition by a Stagnation owing to the

Want of a free Diſcharge; where the *Veſſels* are tender, and the *Circulation* active, terminate in an *Eroſion*, and an *Exulceration* of the *Veſſels*, but not ſo ſoon as from *Obſtructions* in the *pulmonary Arteries*.

When theſe *Veſſels* are ſtrong, and will admit of a large *Diſtention* without being deſtroy'd by it, when the obſtructing *Phlegm* is eaſily diſcharged, and not attended with an *eroding Acrimony*, a *Humoral Aſthma* is produced, whoſe Violence will be increaſed by any Cauſe that adds to the *Quantity*, accelerates the *Motion* of the *Humours*, or irritates the *nervous Syſtem*.

For whenever the Quantity of Humours (by the Prevention of any uſual *Secretion* or *Evacuation*) is increaſed, the whole *vaſcular Frame*, by being diſtended beyond its uſual *Tone*, is irritated and ſollicited to a *Diſcharge*; which, according to the Laws of *Fluids*, will always be determined to theſe *Veſſels*, their *Tone* being deſtroyed, and their Reſiſtance particularly diminiſhed; and this Diſcharge will be moſt remarkably great, when the Quantity of *Humours* retained is moſt increaſed, and the external Preſſure of the Air on the *Lungs* is moſt diminiſhed.

Hence theſe periodical *Fluxions* and *Suffuſions*, ſo much taken notice of by the Ancients, in Diſorders of the *Breaſt*, and which generally happen at the different *Periods* of the *Moon*, but more particularly once a *Month*, may be eaſily explained ; at which Time (as *Sanctorius* (*a*) has demonſtrated) the *Quantity* of Humours is greatly increaſed, and naturally carried off by a more profuſe *Perſpiration* than uſual, but is generally deficient to ſuch Men as are ſubject to theſe *Obſtructions*, tho' as neceſſary to them as the *Lunar* Diſcharges are to Women : And how far the Preſſure of the Air being diminiſhed occaſions a greater Afflux of *Humours*, than uſual, to ſuch *Parts*, the learned Dr. *Mead* (*b*) has evidently demonſtrated.

(*a*) *Medicina Statica. Sect.* 1, *Aph.* 65.
(*b*) *Imperium Solis & Lunæ.*

Whatever increaſes the *Velocity* of the circulating *Fluids*, will likewiſe encourage a greater Afflux of *Humours*, than uſual, on theſe *Veſſels*; or whatever irritates the *nervous Syſtem* will in ſuch Perſons increaſe the *aſthmatic Diſorder*; as the Reſiſtance of the *Lungs* is (*a*) thereby increaſed, and requires a ſtronger Force of Air to *diſtend* them; and as the *obſtructed Veſſels*, by the *ſpaſmodic Contraction* of the Nerves, (which like *Net-work* ſurround all the *Veſſels*) are from their pliable Weakneſs moſt eaſily compreſſed, whence the *impacted Humours* cannot ſo freely as before be diſcharged.

Obſtructions from a cold, indolent *Viſcidity*, have a various *Termination*, according to the particular Nature, and Conſiſtence of the ſtagnating *Humour*; ſometimes the *Glands* and *Veſſels* of the *Lungs* have been ſo greatly obſtructed by ſuch inactive Humours, that the greateſt *Part* of their Subſtance has been at length obſerved to be indura-

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(*a*) *Vide* Pag. 75.

ted, and ſchirrhous; for when the *ſtagnating Humours* have ſuch a particular Nature, they quickly acquire this *Induration* by being deprived of their fine *exhaling Parts*; and the *Veſſels* likewiſe, which are propagated from ſuch as are obſtructed, muſt ſoon wither and contract from the Want of an *Influx* of ſuch *Fluids*, as would lubricate and diſtend them.

(*a*) Sometimes the *obſtructing Humour* is of a *calculous Nature*; and tho' ſuch *Concretions* are more apt to be collected in the *Joynts* and *Kidneys*, yet where there is that general Diſpoſition in the *Fluids*, they may be determined to the *Lungs*, or any other *glandular Part* in a human Body: Books of Obſervations abound with Inſtances of this Nature, (*b*) and a remarkable Caſe is mentioned of one thus affected, who

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(*a*) *Bonet. Anatom. practic. Tom.* 1. *l.* 2. *Sect.* 2. *Obſ.* 6. *p.*684. *obſ.* 14. *p.* 690. *o.* 30. *p.* 697. *o.* 34. *p.* 703. *o.* 53. *p.* 712. *o.* 76. *p.* 722. *o.* 89. *p.* 728 *Sect.* 7. *o* 20. 21. *p.*785. *o.* 32. *p.* 794. *Salmuth. Cent.* 1. *obſ.* 14. *Jo. Rhod. c.* 2. *o.* 21.

(*b*) *Bonet. Tom.* 1. *Sect.* 2. *l.* 2. *obſ.* 126. *p.* 726. *Sect.* 3. *o.* 11. 12. *p.* 596. 597. *Galen. l.* 4. *de loc. affect. Hildan. Cent.* 1. *obſ.* 25. *c.* 2. *o.* 29. *Trallian. l.* 5. *cap.* 4. *Salmuth cent.* 1. *obſ.* 7. *Plater. lib.* 1. *obſ. p.* 180. *Zacut. lib.* 1. *prax. admirab. obſ.* 95. 96. *Schneider. lib.* 3. *de Catarrh. cap.* 7.

received no Relief from the repeated Uſe of the beſt reſolving, and expectorating Medicines, but by taking One Scruple of *Sal Mundæ* three Mornings ſucceſſively, *expectorated* ten *Fragments* of a ſtony Nature, and tho' greatly oppreſſed and emaciated before, quickly recovered after this Diſcharge. (*a*)

All *fixed Salts* ſeem to be of the ſame Nature, and are active, and reſolving, but cannot be depended on, with any great Proſpect of Succeſs, in ſuch a Diſorder. The ſudden Relief received in this Caſe was probably owing to the Strength of the Conſtitution, and the particular Condition of the *Glands*, which were then relaxed and eaſily diſpoſed, by the Aſſiſtance of any ſtimulating Preparation, to give a Paſſage to theſe *calculous Concretions*.

Hence the Diſtinction of a *Phthiſis* into *acute* and *chronical*, and all the various and irregular Symptoms of this Diſtemper, and the different Appear-

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(*a*) *Bonet. Tom.* 1. *lib.* 2. *Sect.* 3. *Obſ.* 11, *p.* 598.

ances, that have been obſerved in the *Lungs* of *diſſected* Perſons, may be eaſily explained: And whoever conſiders what has been delivered in the former Theory, may evidently account for the *Beginning*, *Decay*, *Difficulty of Breathing*, and *Cough*, which are the moſt conſtant Symptoms that attend the firſt Stage of theſe *Obſtructions*; for it is evident from thence that the chief Preparation of the Aliment, and the moſt *material Functions* of the *Animal Oeconomy*, depend on the Welfare of this *Bowel*, and muſt unavoidably *languiſh* when thus obſtructed; and by the ſame means the *Æquilibrium* is deſtroyed, between the Reſiſtance of the *Lungs*, and the Preſſure of the Air, which being no longer capable of giving ſuch a full, and eaſy *Expanſion* to the *Veſicles*, as when they were free, and pliable, *Reſpiration* becomes more *frequent* and *violent*; hence likewiſe a *Cough* is produced, the Capacity of the *Veſicles* being rendered ſo narrow, and compreſſed by theſe *Obſtructions*, that the Air in its Paſſage through them excites an uneaſy *Attrition*, and *Titillation*; and the *obſtructed* Fibres being more *tenſe* than uſual, muſt on a greater *Diſtention* (ſuch as unavoidably attends a full Inſpiration,) be eaſily *irritated* and drawn into theſe ſudden *Contractions*; which are always more remarkably violent when a ſtimulating *Acrimony* is joyned with the *Viſcidity*; this mechanic Motion of *Coughing*, may be juſtly conſidered as the kind Effort of the ſenſible Machine, which by ſuch various, repeated *Concuſſions*, eagerly endeavours to ſhake-off the uneaſy *Stimulus*, and to *attenuate* and *diſlodge* the obſtructing *Humours*.

Whoever perfectly underſtands, the Seat, Nature, various Cauſes, and Conſequences of theſe *Obſtructions*, thus deſcribed, will eaſily know how to apply a particular Method of Cure to each.

For as the Cauſes that produce this *Lentor*, and Diſpoſition in the *Humours* to form *Obſtructions*, and determine them to the *Lungs*, are various, ſo are the Indications and Method of Cure;

but as a *Suppuration* is the *general* Conſequence chiefly to be dreaded, and prevented, the firſt and *general Indication* is to prevent their ending in a *Suppuration* (when there appears an immediate Danger from too great Diſtention) before a particular Method can be ſafely apply'd to the firſt Cauſe of the Diſtemper.

An *Obſtruction* terminates in a *Supporation*, when the Force of Circulation, or the Quantity of the obſtructing Matter *gradually* diſtends the *Veſſels* to ſuch a Degree as to break them, by which Means the *Veſſels*, with the obſtructing Humours, are by the Warmth of the Part gently diſſolved, and mixed together, the finer *Parts* exhale, and the more viſcid remaining form the *Purulent Matter*.

The Increaſe of the *Diſtention* is prevented by diminiſhing the *Quantity*, and *Velocity* of the circulating *Fluids*, and by proper *Revulſions* giving them a different Determination; hence *Bleeding* and gentle *Purgatives* are to be inſiſted on, till this Deſign is obtained, and the *Veſſels* are no longer in immediate Danger of being *diſſolved:* By this Means not only the Danger of an immediate *Suppuration* is prevented, but the original *Obſtructions* are in ſome Degree leſſened; for by diminiſhing the diſtending Force of the *Humours*, the contracting Force of the obſtructed *Veſſels* is in Proportion increaſed; for in all *Obſtructions* as (*a*) *Leuwenhoek* has demonſtrated, the reciprocal, contracting Motion of the *obſtructed Parts* of the *Arteries* is deſtroyed, by being diſtended beyond their *Tone*, and are never carried off till that is reſtored: Another Advantage from theſe previous Evacuations is, that more Room is obtained for the plentiful Uſe of diluting, attenuating, and in ſome Caſes active, ſtimulating Medicines, which cannot otherwiſe be given with the ſame Safety, and Advantage.

When *Obſtructions* are owing to a Viſcidity from too ſlow Motion of the Humours, the Indications are 1*ſt*. To re-

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(*a*) *Tom.* 3. *Epiſt.* 119. *pag.* 113.

reſolve the impacted *Humours*. 2*dly*. To invigorate the Motion, and attenuate the Viſcidity of the Fluids.

Evacuations are therefore to be cautiouſly uſed, unleſs there is an immediate Danger of the *Veſſels* being inflamed, and *ſuppurated*, by being too much diſtended; for as this Diſorder is in a great Meaſure owing to a Weakneſs in the *Veſſels*, and *Bowels*, and thereby to a Circulation too languid, the original Cauſe of the Diſtemper is by Evacuations increaſed; neither are hot, volatile, attenuating, and active *Balſamicks* to be uſed, without the greateſt Caution, leſt by giving too great Force to the circulating Fluids, the impacted *Humours* may be augmented, and more condenſed, the Veſſels more diſtended, and a *Suppuration* in ſtead of a *Reſolution* produced.

Flowers of *Sulphur*, Preparations of the *Millepedes*, Pills made of the reſolving *Gums*, *Ammoniacum*, *Sagapenum*, *Opoponax*, *Myrrh*, *Sapo-venetus*, *Terebinth*: *Balſam peru* taken and waſhed down with a Decoction, made of *Lign. Guaic. Saſſafras. Fol. Chamæpyt. Hyſſop, Scordium, Veronic,* &c. anſwer all the Intentions required in this Caſe, as they are *aperient*, *ſaponaceous*, gently *ſtimulating*, and *reſolving*, and by enlarging the Compaſs of the Blood's Motion, reſtore Perſpiration, and the other *Secretions* to their juſt Proportions.

The Operation of theſe Medicines in this Diſtemper, is agreeable to the natural mechanic Efforts of the *Animal Oeconomy*; for the Action of *Coughing* not only particularly attenuates the *Humours* obſtructing the *Veſſels* of the *Lungs*, but contributes to reſtore the obſtructed *Secretions*, by univerſally determining the *Humours* with a greater Velocity to the Surface of the Body; for this Reaſon the Force of ſuch Medicines muſt be carefully proportioned to the Diſtemper, and the various Exigencies of the Patient; for what are only endu'd with a ſufficient Activity to be ſerviceable in ſome Caſes, may by their too exceſſive Heat be prejudicial to others.

The *Materia medica* abounds with a great Variety of Medicines of this Nature, out of which ſeveral Forms may be eaſily compoſed: And whatever Preparations of this Sort are ſo promiſcuouſly commended by various Authors, in this Diſtemper, are only ſerviceable in ſuch Obſtructions as proceed from theſe particular Cauſes.

Mild *Sudorificks* are by ſome greatly commended in this Caſe, and are frequently found effectual, but tho' their Activity be greater, their Manner of Operation is the ſame with the Medicines already mentioned, which may be eaſily made *Sudorificks*, if determined with greater Force to the Surface of the *Body*; for what promotes *Perſpiration* in one, with a different, and ſometimes with the ſame Management, will prove a *Sudorifick* to another.

The Effects produced from *Sudorificks*, are ſometimes more ſpeedily effectual, than from Medicines which by the Mildneſs of their Operation only promote inſenſible *Perſpiration*; but the Danger that attends their Uſe in exciting too great a Motion of the *Humours* is greater, on which Account they are ſcarce ever to be inſiſted on, but when theſe *Obſtructions* are attended with ſuch a languid *Circulation*, as requires the Uſe of the moſt active, *ſtimulating Medicines*, or when the Patient has a natural Diſpoſition to ſuch Breathings, and finds his *Lungs* relieved by that Evacuation.

Evacuations ought always to precede the Uſe of *Sudorificks*, otherwiſe an *Hæmoptoe*, or an Inflammation, may be probably produced by attempting ſuch a ſudden Diſcharge, while the *Veſſels* are full, and diſtended; on this Account likewiſe *Opiates* are moſt conveniently mixed with them, as they aſſiſt their *Operation*, and allay any Tumult they might otherwiſe excite.

Whoever juſtly conſiders the Operation of *Iſſues*, which are by ſome Authors ſo much inſiſted on in *Obſtructions* of the *Lungs*, and even in a *Phthiſis*, will find they can afford but very ſmall Relief: For they cannot be ſuppoſed to evacuate particularly that Humour which would otherwiſe fall on the *Lungs*, or to ſeparate *corrupted Juices* from the *Blood*; and can be no farther ſerviceable, than in diſcharging from the common Maſs of Humours a ſmall Quantity of ſerous, and lymphatic Juices; which tho' otherwiſe moſt pure and well diſpoſed, acquire the Nature and Conſiſtence of *purulent Matter* by Stagnation. However tho' they are but of ſmall Service in Obſtructions formed in the Lungs from any Cauſe whatever, yet it may be dangerous to cloſe them up in ſuch Perſons who have been long habituated to them, and have weak Lungs, without ſubſtituting ſome other Evacuation in their Place; for the *Veſſels* of ſuch being accuſtomed to a particular Diſtention, may even by this ſmall Addition be irritated to a Diſcharge of the ſuperfluous Quantity on theſe Parts, whoſe Reſiſtance is but languid.

The Diet in this Caſe ought to conſiſt of ſuch Things as afford a light, eaſy Nouriſhment, fit to warm, but not inflame the *Blood*, ſuch as white

Animal Food, and *Broth* made from thence, Butter Sauce, and moſt Roots are improper, as they increaſe the Viſcidity of the *Humours*; *Aſparagus*. *Water-creſſes*, *Selery*, *Turneps*, *Horſe-radiſh*, *Onions*, and (*a*) *Garlick*, are of a different Nature, as they attenuate, and greatly promote *Digeſtion* and *Perſpiration*: Hence (*b*) *Swines-fleſh*, (*c*) *Muſhrooms*, (*d*) *Melons*, (*e*) *Cucumbers* and *Lettuce*, from their Coldneſs, and *Viſcidity*, are particularly pernicious to ſuch *Conſtitutions*: *Wine* diluted with *Water* is preferable for common Drink to any *Malt-liquor*, as this is more apt to relax the *Veſſels*, and increaſe the *Viſcidity* of the *Humours*.

When the *Obſtructions* are by theſe Means carried off, and all Danger of an *Inflammation* is prevented, Preparations of the *peruvian Bark*, and *Chalybeat Waters*, are of the greateſt Efficacy, not only as they correct the original Cauſe by univerſally ſtrengthning the *vaſcular Frame*, and attenuating any

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(*a*) *Sanctor. medicin. ſtatica.* *Sect.* 3. *Aph.* 82. (*b*) *Aph* 24. (*c*) *ibid.* (*d*) *Aph.* 25. (*e*) *Aph.* 92.

remaining *Viſcidity*, but likewiſe contribute to prevent a *Recollection*, by particularly removing the bad Effects of theſe Obſtructions; for tho' Obſtructions are at firſt, in ſome Meaſure, owing to the *Capacity* of the *Veſſels*, not being large enough, to afford a free Paſſage to the *Humours*, yet in the Progreſs of this Diſorder the obſtructed *Veſſels* become greatly diſtended; and when the obſtructing *Humours* are reſolved, and carried off from this remaining Weakneſs, and their *Spring* being almoſt deſtroyed, they are apt again to be obſtructed, from a Cauſe different from that which firſt produced this *Diſtemper*.

From a Neglect, or Ignorance of this Obſervation, Perſons that have been affected with *Coughs* for ſome time, and have been relieved, are ſo eaſily apt to relapſe into the ſame Diſorder. For, as no *Obſtruction* is carried off, till the diſtended *Veſſel* recovers its reciprocal *tonic Motion*, ſo to prevent a *Recollection*, the ſame muſt be preſerved, and too great a Diſtention of it prevented. Nothing more contributes to this than *Exerciſe*, and particularly *Riding*; For then the Preſſure of the Air, on *theſe* weakned *Veſſels*, is much greater, than in a ſtate of Reſt; and increaſes in Proportion to the Velocity of the Body in Motion; for Air being an *elaſtic Body*, re-acts with the ſame Force 'tis acted on; by which Means the weakned, and diſtended *Veſſels* are thereby ſufficiently preſſed, and ſtrengthned, the contained *Humours* attenuated, and preſerved in a juſt degree of *Fluidity*.

Hence it appears, that this Exerciſe not only as it is attended with the leaſt Expence of *Spirits*, but likewiſe from this increaſed *Preſſure*, is preferable to any other *muſcular Motion*, not attended with ſuch a Velocity of the *Body*: And why ſuch conſiderable Effects are particularly produced from it in this Diſtemper, is evident to ſuch as conſider, that the *Humours* of the Body receive their moſt material Alterations from the Action of the *Lungs*, and how that in a great Meaſure depends on the

Preſſure of the Air, whoſe *Gravity* may, by this Means, be increaſed to any Degree deſired, and the bad Effects of ſuch a Diſpoſition of the Air, as frequently brings on theſe *Obſtructions*, moſt effectually prevented.

The Uſe of the *Fleſh Bruſh* is likewiſe very ſerviceable, as it powerfully ſtrengthens, and cleanſes the perſpirable *Veſſels*, and attenuates the *Humours*, contained in the *Veſſels*, on the ſurface of the *Body*; which by their great Diſtance from the firſt Cauſe of Motion, and by being moſt expoſed to external Cold, are particularly apt to become *Viſcid:* This Exerciſe was in the greateſt Eſteem among the Ancients, tho' ſince too much neglected, perhaps on Account of its great ſimplicity.

Coughs which attend old Perſons from cold *Pituitous Obſtructions*, where the *Tone* of the *Lungs* is deſtroyed, and the other *Secretions* are diminiſhed by the Weakneſs of the Circulation, and the univerſal Rigidity of the *Veſſels*, are ſcarce ever to be cured; but are beſt corrected by the Uſe of a ſoft, light, *Aromatic Diet*, and Medicines of the ſame Nature. Wine mixed or prepared with Honey, is preferable in this Caſe to hot Cordials, which exhauſt the few remaining fluid Parts of their *Humours*, and increaſe the Dryneſs of their *Fibres*, which are already incapable of exerting their *Vibrations*, by being too parched and rigid.

When the obſtructing *Humour*, is of a terreſtrial, cold, *Viſcid* Nature, diſpoſed to terminate in a *Schirrhus*, or a *ſtony Concretion*, *Mercurius dulcis* added in ſuch a Quantity, as it may prove an Alterative to Pills made of the reſolving Gumms, and waſhed down with a ſtrong *Decoction* of *Guaicum* is of the greateſt Efficacy.

When *Obſtructions* are formed in the *Lungs*, from a *Viſcid* Diſpoſition of *Humours*, proceeding from too great Heat, and Motion, *Bleeding*, and cooling lenitive *Purgatives*, with *Anodynes* after their Operation is finiſhed, are to be freely uſed, and repeated, till all Danger of an Inflammation is prevented, and the Force of theſe *Obſtructions* is diminiſhed, by giving a different *Determination* to the *Humours*; which will at length totally yield to a careful Uſe of diluting, reſolving, and gently deterging Medicines; ſuch as *Sperma ceti*, *ſtibium diaphoreticum Nitratum*, *Sal prunel*, pectoral Ptiſans, and medicated whey, prepared with Ingredients ſuited to theſe Intentions; ſuch as *Fol. Agrimon. Pulmonar. Tuſſilag. Betonic. Parietar. Taraxac. Heder. terreſt. rad*, *Glycyrrhizæ*, &c. with Preparations of *Honey*. *Hot*, *Volatile Medicines*, and active *Balſamicks*, are in this Caſe particularly deſtructive: The lighteſt animal Food is only to be allowed, and that but ſparingly; a cooling *Vegetable* Diet is chiefly to be inſiſted on, and for common Drink Toaſt and Water, or with a ſmall Quantity of Wine mixed with it, and made gratefully acid with the Juice of *Sevil Orange*. This Method is to be continued while any Diſpoſition to an Inflammation remains in the *Humours*, and at length a greater Latitude in Diet is to be gradually allowed.

Perhaps it may be objected againſt the Uſe of purging Medicines in *Obſtructions* of the *Lungs*, as being a Practice contrary to what *Hippocrates* has laid down, who in Diſorders of the *Breaſt* (*a*) and in *dry Coughs* particularly, (*b*) forbids the Uſe of *Purgatives*: But tho' this Method ſeems directly to oppoſe the Words, 'tis agreeable to the Intention of this Precept; for whatever carries off the finer Parts of the *Humours*, and leaves the groſs behind, and conſequently more diſpoſed to form *Obſtructions*, muſt be pernicious; and ſuch was the Effect produced by hot, rough *Cathartics*, ſuch as *Hellebor. Elaterium*, &c. which were only uſed in the Time of *Hippocrates*, which he therefore wiſely forbid, as they increaſed the *Obſtructions* by exhauſting the finer *Parts* of the Humours, and by their exceſſive *Heat*, and *Acrimony*, frequently changed them into a *Suppuration*;

(*a*) *Lib. de veratri uſu. p. m.* 611.
(*b*) *De ratione victus in morb. acut*, *Sect*. 4.

but gentle, lenitive *Purgatives*, which are directed in this Caſe, as they produce contrary Effects, in attenuating, and cooling the *Humours*, muſt be moſt proper, and in that Reſpect agreeable to the Senſe of the divine *Hippocrates*.

When *Obſtructions* of the *Pulmonary Veſſels* proceed from *indigeſted Humours*, the *Indications* are to reſtore the *impaired Digeſtions*, and to reſolve the *impacted Humours*: The firſt *Intention* is anſwered by ſuch *Medicines* as evacuate any remaining *Viſcidity*, and by ſtrengthning the *Stomach* and *Bowels* prevent a *Recollection*; hence gentle, *Stomachic Purgatives*, ſuch as *Tinctura Sacra*, *Pil Rufi*, *Elix. ppts. Rhubarb*, &c. are not only ſerviceable in this Reſpect, but by producing a *Revulſion*, diminiſh the Force of the *Obſtructions*: All *Bitters* are deſervedly eſteemed for ſtrengthning, and reſtoring *Digeſtion*, and attenuating cold, viſcid *Humours*; which Effects they produce by imitating the *bilious Juice*, which is Nature's *great Digeſter*, and chiefly contributes to conquer, and attenuate the Viſcidity of the Chyle, and give it an uniform Conſiſtence; for this Reaſon the *Bile* of *voracious Animals*, particularly the *Sea Pike*, made up into *Pills* with proper *Stomachics*, has often reſtored ſuch, who have been in moſt languid Circumſtances, from Indigeſtion, and Loſs of Appetite, where the moſt elaborate, *Chymical Preparations* have been ineffectually preſcribed: When the ſecond Digeſtion is likewiſe defective, the *Peruvian Bark* and *Steel* demand a principal Place, as they particularly ſtrengthen the firſt *Paſſages*, and invigorate the whole *Vaſcular Syſtem.*

Emetics are frequently preſcribed in this Diſtemper, as they anſwer ſeveral *Intentions*; and if at any Time, are then particularly proper, when theſe *Obſtructions* are owing to *Indigeſtion*; but whoever juſtly conſiders how far their Efficacy extends, and to what Inconveniencies they are ſubject, will be apt to prefer the Uſe of other *Medicines* to them. The only Advantage that can be propoſed from the Uſe of Emetics, is that the firſt Paſſages, and particularly the *Stomach*, may be thereby relieved from any Load of viſcid, indigeſted Humours; and that by the univerſal Concuſſion which attends their Operation, the Fluids in general might be attenuated, and the Obſtructions in the *Lungs* diſlodged: The former *Intention* can be as effectually anſwered by the Uſe of gentle, ſtomachic *Purgatives*; and the other by *attenuating*, *reſolving Medicines*, which act with more Certainty, and leſs Danger: For notwithſtanding the Operation of *Emetics* may ſafely in ſome Caſes promote theſe Effects, where their Force is well proportioned, and the *Veſſels* of the *Lungs* are ſtrong, and not much diſtended, yet when their Operation is violent, or the *Veſſels* weak, and diſtended, ſuch an unnatural Straining of the *Fibres*, at the ſame Time the Humours receive a powerful *Momentum*, might very probably either promote an *Inflammation*, or an *Hæmoptoe*: On this Account (*a*)

(*a*) *Sect.* 4. *Aph.* 8.

Hippocrates very juſtly diſapproves the Uſe of them for conſumptive Perſons, τοὺς δὲ φθινώδεας ὑποστελλομένους τὰς ἄνω (φαρμακείας.) And (*a*) *Tulpius* takes Notice of one affected with a *Diſtillation*, and a *Cough*, from pituitous *Obſtructions* of the *Pulmonary Veſſels*, that by the Uſe of an *Antimonial* Vomit, was ſeized with a moſt violent *Hæmoptoe*, attended with an *Expectoration* of a large Piece of the *Lungs*, of which he immediately expired.

Until the *Digeſtions* are effectually reſtored, and ſtrengthened, the *Diet* ought to be of the lighteſt *Digeſtion*, and leaſt inclined to *Viſcidity*; ſuch as before is recommended in *Obſtructions* proceeding from a languid *Lentor* in the Humours: By this Means the weakned *Parts* when diſengaged from any Load, or Labour, will more eaſily recover a ſufficient *Vigour*; eſpecially when aſſiſted by ſuitable Medicines; *Exerciſe* is particularly proper in this Caſe, not only as it is ſerviceable in the Reſpects mentioned before, but as it peculiarly

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(*a*) *Lib.* 2. *Obſerv.* 14.

helps *Digeſtion*, and the *Secretion* of the *bilious Juice* (whoſe *Quantity* ſeparated in inactive *Conſtitutions* is very ſmall, unleſs promoted by *nervous Spaſms*, and then its *Quality* is depraved) for the *Chylopoietic Bowels* are ſcarce influenced by the grand Circulation, but are like a ſmall, *ſeparate Republick* in the *Body*, which is governed by peculiar Laws, and chiefly aſſiſted by *muſcular Motion*.

The Indication of Cure, in *reſolving* the obſtructed *Veſſels* of the *Lungs*, is anſwered in this Caſe by Medicines of the ſame Nature as are recommended in that languid *Viſcidity* of the *Humours*; particular Regard being had to the original Cauſe, which laid the firſt Foundation of the Diſtemper.

When theſe Obſtructions are attended with Nervous, and *Hypochondriac Symptoms*, *Aſſa* F*œtida* added to the *reſolving Gumms* mentioned before, is of the greateſt Service, and demands a principal Place. The Efficacy of this *Medicine*, in a great Meaſure depends on the *fetid* and *diſagreeable Smell* it affords;

fords; this is the Reaſon that makes the Uſe of it leſs frequent; the Practice of *Phyſic* being often rather calculated for the immediate Satisfaction than the real Benefit of the Patient: The Activity of its *Parts*, corrected, and retained, in a ſoft, gummy Subſtance, renders it in theſe Caſes more effectual, and on ſeveral Accounts preferable to *Volatile Spirits*, which by their exceſſive Heat are often of ill Effect, and apt to inflame; whatever Relief is received from them, is but momentary, and tranſient; for the ſame volatile Activity, on which their Virtue depends, prevents it from being laſting, being quickly diſſipated by the Heat of the Body: Whereas *Aſſa fætida* by the peculiar Diſpoſition of its Parts, gives a more laſting, and a more agreeable Determination to the Spirits; for no *Bodies* are ſo capable to affect our Nerves after an agreeable Manner, as thoſe which conſiſt of volatile Parts, the Activity whereof is tempered, and allayed, by the Smoothneſs of ſuch as are *lubricating*, and *oily*: This Medicine is therefore not only ſerviceable in Obſtructions of the *Pulmonary Veſſels*, as it gently *ſtimulates*, and *attenuates* the *Viſcidity* of the *Fluids*, and moſt powerfully promotes (*a*) *Perſpiration*; but by giving that agreeable *Diſpoſition* to the *Solids*, enlarges their Capacity, by taking off the *nervous Contractions*, and *Spaſms*, which in a great Meaſure render *Hypochondriac Perſons* ſo particularly ſubject to this Diſtemper. In this Part of its Character, and Operation, it is ſomewhat allied to (*b*) *Opiates*, but not ſubject to the ſame ſtupifying Inconveniences; and on that Account frequently gives Relief, where that Sort of Medicine is not only ineffectual, but of ill Effect to the Patient.

When theſe *Obſtructions* proceed from the ſaline Parts of the Blood irritating, and drawing the tender *Veſſels* of the *Lungs* into narrow Contractions, that *Acrimony*, as it receives a various Origine, muſt be corrected by *Medicines*,

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(*a*) *Sanct. Medicin. Statica. Sect.* 3. *Aph*, 82.
(*b*) *Mead*, Eſſay on Poyſons. *p.* 145, 147.

particularly oppoſite to the Nature of it.

(*a*) It is evident from the moſt exact *Chymical Experiments*, that the *eſſential Salts* in the Humours of a Human Body, are in a natural State neither *fixed*, nor *volatile*; but of a *ſemi-fixed* Nature, and become pernicious when this *neutral Quality* is altered, when they are inclined more to one Side than another, or when their *Quantity* is increaſed, and diſproportioned to the other Principles of the Humours.

When the Circulation from any Cauſe whatever is rendered ſlow, and languid, the *ſaline Parts* are not ſufficiently actuated, and equally mixed with the oily *Parts* of the *Blood*, and from the Slowneſs of their Motion are apt to be ſeparated by the *Glandular Parts*, and to irritate and obſtruct them: This *Conſtitution* of *Humours* chiefly prevails in ſuch, as lead an inactive Life, and feed much on an *acid*, *vegetable Diet*, which for the moſt Part contains a *fix-*

(*a*) Boerhaave. *Chemia Practic. Proceſſ.* 87.

ed Salt; but is more particularly encouraged by a *muriatic ſaline Diet*; for *Sea Salt* is of ſuch a fixed Nature, and ſo intimately adheres to the terreſtrial, and oily Parts of the Blood, (eſpecially where there is an univerſal Viſcidity in the Fluids) that it cannot be diſengaged and conquered but with the greateſt Difficulty.

In this Caſe *artificial Lime-waters* are of the greateſt Efficacy, and moſt powerfully contribute to correct the Acrimony of theſe Salts, and by the great Activity of their Parts to extricate, and render them more *volatile*: For 'tis plain from Chymical Experiments, that no Preparation gives ſuch a volatile Activity to the *Humours* of a human *Body* as *Quick-lime*; which Property it ſeems to take from the Particles of Fire which are intimately united with it: On this Account that *muriatic Acrimony* to which Mariners are particularly ſubject, is moſt ſpeedily eradicated by a Preparation of this Nature, taken in a Quantity ſuited to the Strength of their *Conſtitution*, and the Force of the Diſtemper:

per: but muſt be directed with the greateſt Caution; for if the Uſe of it be too much inſiſted on, after this Acrimony is corrected, it may prove as dangerous, as before it was uſeful, by giving a contrary Diſpoſition, and a *cauſtic Activity* to the *Humours*.

Where the *ſaline Parts* of the *Blood* are too naked, and volatile, the *Humours* diſſolved, and inclined to Putrefaction, all Preparations of *Quick-lime* give a fatal Increaſe to theſe Symptoms, (and tho' *Sea Salt* be in this Caſe improper, as by its Weight, and *Stimulus*, it quickens the *Circulation*, yet there is no Danger of its being entangled in *Fluids* ſo diſſolved.) This Conſtitution of Humours is natural to ſome, and moſt frequently attends ſuch as are ſubject to a *Phthiſis* from an *Hæmoptoe*, (as the former often attends ſuch as are ſubject to a *Phthiſis* from *Obſtructions*) and is greatly encouraged by the exorbitant Uſe of an Animal Diet, eſpecially of ſuch which is remarkable for the Delicacy of its Flavour, and moſt plentifully abounds with *volatile Salts*.

This *Acrimony* is beſt corrected by ſuch *Medicines* as ſheath the Aſperities of theſe Salts, and reſtrain the Motion of the Humours: Such as Water which paſſes through natural *Lime-ſtone*, or *Chalky Ground*; ſuch as the *Briſtol* Waters afford, which widely differ from *artificial Lime-waters*: A *Milk Diet*, Preparations of *Snails*, and ſoft *Diuretics*, are particularly proper in this Caſe, as they correct the *Acrimony* of theſe *Salts*, and convey them off by the *urinary* Paſſages, which ſeem to be the moſt proper *Channel* for conveying theſe *Salts* out of the *Body*.

Hence may be explained that Obſervation, (which is mentioned in the Philoſophical Tranſactions of the Royal Academy of *Paris*, as obſcure and ſurprizing) why a *Lixivium* of *Quicklime* is given with ſo much Succeſs in *Scorbutic*, and other *Chronic* Diſorders in the Northern Countries, but is found inſufficient, and frequently deſtructive in the ſame Diſeaſes, when given to ſuch as live in *France*, *Italy*, and other Places that lie towards the South? This

Difference in their *Conſtitution* is owing to the Difference of the *Climates* they live in; the Humours of the latter by the Warmth of their Climate are greatly actuated, and attenuated, whence the *ſaline Parts* already ſufficiently active, by the Acceſſion of any Cauſe that ſo much increaſes the Heat of the Humours, are eaſily *volatilized* and *exalted:* Whereas the *Fluids* of ſuch who live in cold, Northern Climates, are languid in their Motion, and the *ſaline Parts* are thence ſo involved in the *terreſtrial*, and *oily Parts* of the *Blood*, as to require the Uſe of ſuch an active Preparation to diſengage them.

When the Cauſes that produce *Obſtructions* in the *Lungs* are blended together, (as it frequently happens,) a more complicated Method of Cure is required; and may be eaſily deduced from that which has been delivered, which is particularly ſuited to all the various Cauſes of this *Diſtemper*; and chiefly conſiſts in removing the *Obſtructions* formed in the *Veſſels*, and the evil Effects of them; and in reſtoring the uſual *obſtructed Secretions*, by correcting the original *Viſcidity* of the *Fluids.* If either *Intention* be left unfiniſhed, the Diſorder will continue, or quickly return: And whatever *Medicines* are ſo promiſcuouſly recommended in this *Diſtemper*, can only give Relief, as they contribute to anſwer theſe *Intentions.*

The *Veſſels* of the *Lungs* when obſtructed, can only be relieved by promoting a *Reſolution*, or an *Expectoration* of the obſtructing *Humours.* This laſt Relief can only be obtained in *Obſtructions* of the *Bronchial Arteries*, which terminate in the ſeveral *Ramifications* of the *Bronchia:* And Obſtructions of the *Pulmonary Arteries*, can only be carried off by a *Reſolution*, (unleſs after a *Suppuration* of them) as they terminate only in the *Pulmonary Veins.* But although there be this Difference in the *Veſſels*, and the Diſcharge, yet the *Medicines* which are required to anſwer each Intention, have in every Reſpect the ſame *Qualities*, and Manner of *Operation.*

For that a *Reſolution* of the *impacted Humour* in the *Pulmonary Arteries* ſhould be obtained, 'tis neceſſary that the *obſtructing Humours* ſhould be prepared for Motion, the *Veſſels* ſufficiently opened to give a Paſſage to them, and that they ſhould be then *ſtimulated* to an *Expulſion.* The ſame Diſpoſition muſt be exactly given to the *Humours* and *Veſſels* of the *Bronchial Arteries* that they may be relieved by *Expectoration.* The only Difference is that in the former Caſe the obſtructing *Humours* are expelled into the *Pulmonary Veins*, in the latter, into the *Aſpera Arteria.*

Hence it appears, that as various Cauſes may prevent either a *Reſolution*, or an *Expectoration*, no *ſpecific*, or certain Form of Medicine, can be depended on; but muſt be always carefully ſuited to the particular Diſpoſition of the *Veſſels*, and *Humours*: For the beſt *pectoral Medicines*, ſo greatly extolled by ſome Authors, can only be ſerviceable in ſome particular Caſes; and operate after the ſame Manner as other

Medicines, either by univerſally *attenuating*, *ſtimulating*, *incraſſating*, &c. Thus *Hyſſopus*, *Scordium*, *Majorana*, *Pulegium*, *Veronica*, Preparations of *Sulphur*, &c. which are ſo much relied on as Pectorals, are only ſerviceable when the *Humours* have a languid *Viſcidity*, and the *Fibres* are inactive; but prove ineffectual and dangerous, when the *Humours* are *acrimonious*, and the *Veſſels* contracted: In which Caſe *Pulmonaria*, *Tuſſilago*, and the ſofter Pectorals are required, which correct the *Acrimony* of the *Humours*, and relax and lubricate the *Veſſels*.

If any thing can be reckoned a *Tonic* Pectoral, 'tis *Air*, impregnated with ſuch Vapours, as are fit to correct the bad Diſpoſition of the *Lungs*. Thus when from a Weakneſs of their *Veſſels* they are ſubject to a frequent Suffuſion of thin, acrimonious *Humours*; a Fumigation of *Olibanum*, *Maſtich*, and *Benzoin*, is the beſt, and moſt effectual Pectoral. But in the Uſe of this *Preparation*, particular Care muſt be taken that the *Lungs* are then free, and diſengaged from any Load of *Humours*; and that by *Diaphoretics*, or mild Sudorifics, the Courſe of the Humours be determined to the Surface of the *Body*. When the *Veſſels* are too much contracted, and the *Humours* to be expectorated, or reſolved, glutinous, and viſcid; an Evaporation of hot Water, with ſtimulating Herbs infuſed, is of the greateſt Benefit.

When *ſulphureous*, or *arſenical Steams*, or the *Effluvia* of *Aq. fortis*, or *Sp.* of *Vitriol*, are received into the *Lungs*, (as it frequently happens to *Miners*, and ſuch as are much engaged in *Chymical Preparations* of theſe Bodies) moſt violent *Aſthmatic* Diſorders, and *Peripneumonies* are thence produced. In this Caſe, the Vapour of *putrid Urine*, with *Sal. Tart.* diſſolved in it, and immediately received into the *Lungs*, is the moſt effectual *Pectoral*; the *acid*, corroding Particles irritating the *Lungs*, being thereby corrected, and changed into an innocent, inactive *Sal neutrum*.

Oily Sinctus's, and *Anodyne* Medicines, are moſt frequently preſcribed in *Obſtructions* of the *Lungs*, to remove, and allay the Violence of the *Cough*: Which *Intention* they anſwer, not by diminiſhing the Cauſe of ſuch *Obſtructions*, but by taking off the inconvenient Effects produced from them; for by frequent Coughing, the Inſide of the *Aſpera Arteria* being abraded, and deprived of its lubricating, defenſive *Mucus*, becomes thence ſo ſenſible as to be eaſily irritated by the Coldneſs of the Air, or by the *Humours* naturally ſeparated there from the *Glands*; which at firſt are ſo thin, as to be apt to irritate theſe tender, naked Parts; but acquire that *mucilaginous Softneſs*, by remaining there for ſome Time, (the finer and more ſubtle Parts exhaling) ſo that whatever ſupplies an artificial Defence, or gives theſe too tender *Parts* ſuch an Inſenſibility, that the Humours ſeparated, may remain there for ſome time, without being deterged by Coughing, will obtain the Name of *Pectorals*: The *Syrups*, and *Oils*, ſo much relied on in this Caſe, are only uſeful as they anſwer the firſt Intention: And the Relief they afford is ſo ſudden, that their Efficacy cannot be imputed to their entering, or altering the *Maſs* of *Humours*, and arriving at the *Lungs* by the common Road of *Circulation*. But by being gently ſwallowed, they give a freſh Defence to the Glands placed about the Top of the *Aſpera Arteria*: For as the Paſſage in this Place is moſt narrow, the Air when expelled by violent Coughing, produces a greater *Abraſion* there than in any other *Parts*: *Opiates*, and *Anodynes*, as they anſwer the other Intention, are remarkable in relieving Coughs; for by rendring the *Fibres* leſs ſenſible, they elude the Force of theſe uneaſy *Irritations*, which by exciting a Cough perpetually abrade the ſeparated *Humours*; by this Means they have Time to acquire a ſoft, and proper Conſiſtence.

Hence it appears, that theſe *oily Medicines* in regard to the original *Obſtructions* are moſt pernicious; for as much as they relax the Stomach, and increaſe the *Viſcidity* of the *Humours*. And notwithſtanding in *Catarrhs*, and *Defluxi-*

fluxions, they abate the preſent Violence of the Cough by *lubricating the Glands*, yet by relaxing, and giving them a leſs Reſiſtance, they encourage a new Influx of *Humours*, and thence render ſuch Diſorders more obſtinate. *Hypoglottids* formed of *Japan Earth*, *Sugar*, and *ſoft Mucilages*, diſſolved in the Mouth, and gently ſwallowed, are preferable in ſuch Caſes to oily *Preparations*; for they abate the Influx of *Humours* by reſtoring the relaxed Tone of the *Glands*, at the ſame Time that by giving them a ſoft Defence, they allay the uneaſy *Irritations*.

Anodynes, joyned with proper *Pectorals*, and prudently adminiſtred, eſpecially after *Evacuations*, are of the greateſt Service: As they quiet any Tumult in the *Humours*, and contribute to prevent an Inflammation, by keeping the *Lungs* more free from frequent Concuſſions; and promote an eaſier Diſcharge of the obſtructing Humours by giving them a proper Conſiſtence, and by enlarging the Capacity of the *Veſſels*.

Thus I have deſcribed the various Cauſes, and Effects of *Obſtructions* formed in the *Veſſels* of the *Lungs*; and how by a moſt rational Method carefully ſuited to them, they may be carried off, and their *gradual Progreſs* to a *Suppuration* happily prevented. It remains now to explain, how a *Suppuration* is likewiſe produced from an *Hæmoptoe*; with the moſt probable Method of Cure in the laſt, and moſt dangerous Stage of this Diſtemper.

The Cauſes prediſpoſing to an *Hæmoptoe* are various; but may be reduced to whatever gives the *Veſſels* of the *Lungs* ſuch a Tenderneſs, and the *Humours* ſuch a Force, and Acrimony, as muſt, if increaſed, diſſolve their *Continuity*.

This Prediſpoſition, generally conſiſts in an univerſal Weakneſs of the *Solids*, and that volatile *Acrimony* and *Diſſolution* of the *Humours*, which has been already deſcribed, (*a*) and is peculiar to ſuch conſumptive *Fluids*.

(*a*) *Vide Pag.* 165.

This *Conſtitution* to ſome is natural, and hereditary; but may in others be acquired, by the intemperate Uſe of a *hot*, *aromatic*, *ſaline*, or *animal Diet*: Or by previous Diſorders, which relax the *Veſſels*, and deprive the *Blood* of its *oily*, and *balſamic Parts*, and render its *Salts* too *active*, and *volatile*.

A natural Prediſpoſition to an *Hæmoptoe*, may be eaſily diſtinguiſhed by ſeveral Symptoms, which are peculiar to ſuch conſumptive *Conſtitutions*, *viz.* a long Neck, *Scapulæ* prominent like Wings, *Thorax* compreſſed, and narrow, a clear florid Complexion, the Cheeks and Lips painted with the pureſt red, the *Caruncle* in the Corner of their Eye, from its intenſe Colour, appears like *Coral*; and all the *Veſſels* are ſo fine, as to be almoſt *diaphanous*: Such Perſons are likewiſe moſt frequently remarkable for a Vivacity of Mind; and often complain either of (what is called) a *Diſtillation*, or of a *ſaline Taſte* in the Mouth.

In *Conſtitutions* either naturally, or otherwiſe thus prediſpoſed, whatever deter determines the *Humours* to the *Lungs*, with a Force greater than their Reſiſtance, will immediately produce an *Hæmoptoe*. Theſe Cauſes are various, ſuch as a *hot*, *ſaline*, *aromatic Diet*, violent *Exerciſe* of the *Body*, particularly of the *Lungs*, Coughing, free Uſe of ſpirituous Liquors, ſtrong *Paſſions* of the Mind, any uſual *Secretions*, or *Evacuations* prevented, &c. but in general may be reduced to whatever increaſes the *Acrimony*, *Quantity*, or *Velocity* of ſuch *Fluids*.

Whatever increaſes the *Quantity* will likewiſe increaſe the *Velocity*, and Preſſure of the *Fluids* on the *Veſſels* of the *Lungs*; but if the *Liquids ingeſted* be of a hot Nature, ſuch as ſpirituous Liquors, or if the *Humours* retained have that Diſpoſition, their Velocity will be in Proportion increaſed: Hence all *ſanguineous Diſcharges* prevented, ſuch as the *Hæmorrhoids* in Men, and the *Catamenia* in Women, are moſt particularly apt to produce an *Hæmoptoe*.

Hence appears the Reaſon, why an *Hæmoptoe* ſo frequently happens at that

Time when the Body deſiſts from growing? The Quantity, and Preſſure of the Humours being then more particularly increaſed, by not being expended, as before, in giving a conſtant Addition to the *Veſſels*; which are then likewiſe in more Danger of a *Rupture* by their greater *Reſiſtance*, than when formerly they yielded to the Impulſe of the *circulating Fluids*.

Hence likewiſe appears the Reaſon, why an (*a*) *Hæmoptoe* ſeldom happens before the Age of eighteen, or after thirty five? For in the former Caſe the Impulſe of the *Humours* is but weak, and the *Veſſels* are pliable, and yielding: In the latter Caſe, the *Fibres*, by repeated Motions, are compacted, and made firm, and are thence capable of ſafely reſiſting the ſtrongeſt *Impulſe* of the *circulating Fluids*.

When the *Veſſels* of the *Lungs*, from any of the Cauſes before mentioned, are *obſtructed*, and *diſtended*, whatever increaſes the *Velocity*, *Quantity*, or *A-*

(*a*) Hippocrates, *Lib.* 5. *Aph.* 5.

crimony of the *Humours*, may eaſily produce an *Hæmoptoe*. For the Weakneſs of a *Veſſel*, is always in Proportion to its Diſtention: And on that Account, ſuch Perſons have always a Prediſpoſition to an *Hæmoptoe*, not only from ſuch a *Diſtention* of the *Solids*, but from that *eroding Acrimony*, which the obſtructing *Humours* are by ſtagnating apt to acquire.

The Seat of an *Hæmoptoe*, is either in the *Pulmonary* or *Bronchial Arteries*; and may be eaſily diſtinguiſhed being attended with different Symptoms. For in an *Hæmoptoe* of the former *Veſſels*, the Quantity of *Blood expectorated* is large, of a thin Conſiſtence, and a florid Colour, without any Senſe of Pain, and then the Diſcharge entirely ſtops for ſome Time. In an *Hæmoptoe* of the *Bronchial* Arteries, the Quantity of *Blood expectorated* is but ſmall, but continued for a conſiderable Time; its Colour is more obſcure; its Conſiſtence not ſo thin; and is attended with a Senſe of *Pain* in the *Breaſt*.

That the Seat of an *Hæmoptoe* may be more particularly known, the Manner how *Blood* is diſcharged muſt be carefully regarded; for what is hawked up, comes only from the Palate, and the Veſſels about the *Larynx*; what is ſpit up, from the Mouth; what is vomited, from the *Stomach*; from the *aſpera Arteria*, by a ſmall Cough, and more elaborate Hawking; and the deeper the Rupture is in the *Lungs*, the more profound, and violent Cough attends the *Expectoration.*

Sometimes an *Hæmoptoe* of the *Bronchial* Arteries is preceded by a *Repletion*, and Senſe of a greater Weight than uſual, occaſioned by a Retention of ſome habitual, ſanguineous Evacuation; ſuch as the *Hæmorrhoids* in Men, and the *Catamenia* in Women; and then proves ſerviceable, and is not ſucceeded by a Collection, or Diſcharge of *purulent Matter*, for in this Caſe, there is no Rupture, or Diſunion of the *Veſſels*; but their extreme *Orifices* which in their natural State always exhaled a lubricating Moiſture, are now ſo dilated and widened, as to admit a Diſcharge of this *Plethoric Blood*, after the ſame Manner as it is periodically evacuated by the *Uterine Arteries.*

After an *Hæmoptoe*, particularly of the *Pulmonary Arteries*, lying on the affected Side is apt to renew the Diſcharge, the *Veſſels* being then more preſſed and irritated: Sometimes the *Oppreſſion* has been ſo remarkably increaſed by this Poſture, as to hinder the Perſon from ſpeaking; but has been immediately relieved by lying on the contrary Side.

When an *Hæmoptoe* has happened, the Indications are, 1*ſt.* to reunite the ruptur'd *Veſſels.* 2*dly.* to correct the *Acrimony*, and *Heat* of the *Humours.*

To anſwer the firſt *Indication*, *Bleeding* is to be plentifully uſed, and repeated, till the diſunited *Veſſels* are almoſt *collapſed* and thence *contracted*; and the Motion of the remaining *circulating Humours* becomes ſo languid, as to be incapable of widening, and opening them again; but that the *Wound* ſhould be thereby kept in ſuch a State of *Reſt*, as can alone diſpoſe it to a *Reunion*.

To ſome perhaps it may ſeem unreaſonable, and dangerous, to take away ſuch a Quantity of *Blood*, from Perſons already ſo weak and languid; but let ſuch conſider, that a few Ounces of *Blood* evacuated by the *Lungs*, will in the Conſequence bring on a more dangerous Weakneſs, than a much greater Quantity thus diſcharged; for the former, by increaſing the Wound, and Cough, will in Proportion afterwards increaſe the Quantity of *purulent Matter*. And this ſucceeding Collection is ſo certain, and ſo conſtantly increaſes, and grows ſo large when the *Lungs* are agitated, and the *Circulation* is not ſufficiently abated, that out of a great Number, few recover from an *Hæmoptoe* of the *Pulmonary Arteries*; tho' ſome ſurprizing Inſtances have been known of Wounds received in the *Lungs*, attended with ſuch a great Effuſion of *Blood*, that the Perſon thus affected has remained half dead, and without Motion for a long Time: And by being thus fortunately neglected, the Wound has reunited, and a perfect State of Health ſucceeded, which had been unavoidably loſt, if he had been revived, by cordial Medicines, which are moſt frequently given, tho' deſtructive in this Caſe.

Cooling, Anodyne Medicines, ſuch as *Cort. peruv. Fol. plantagin. Urticar. Flor. papar. Rhæad. Pentaphyll. Rub. Paluſt. Roſar. rub. Semin. Acetos, Papar. alb. Hyoſcyam. Rad. Pentaphylloid. Argentin. Pimpinel. Tormentil.* and ſoft, ſmooth Balſamics, ſuch *Fol. Tuſſilag. Pulmonar. Flores puri, recentes, Betonic, Hyperic, Paralys, Althеæ,* &c. anſwer the ſecond *Intention*; as they reſtrain the Heat, and Motion of the *Humours*; and ſheath up the *ſtimulating Particles*, that irritate the Solids into ſtronger, and quicker *Vibrations.*

Theſe *Medicines* are moſt effectual, when prepared by Decoction, becauſe in no other Form they can ſo eaſily paſs through the *Veſſels*, and communicate their Virtues to the *Blood.*

The Operation of theſe *Medicines*, is not *topical*, but *univerſal:* Tho' ſeveral Authors are of Opinion, that an *Hæmoptoe* may be cured by proper, ſpecific Medicines, which particularly exert their Efficacy on the *Veſſels* that are diſunited. But it is moſt evident to any one, who is rightly acquainted with the *Animal Oeconomy*, that the ſtopping of an *Hæmoptoe*, is either the natural Conſequence of the large Effuſion of *Blood* which attends it, (the *Veſſels* being thereby ſufficiently emptied, and collapſed; and the *Momentum* of the *circulating Fluids*, from the ſame Cauſe being rendered ſlow, and languid:) or that theſe Effects are obtained by *artificial Evacuations*, and cooling, ſoft *Medicines*. For if *Medicines* that particularly exerted their Virtues on the wounded Part, could produce this Alteration, their Operation muſt conſiſt, in either *incraſſating* the *Blood* to that Degree, that it is no longer capable of paſſing through the *diſunited Veſſels*; or in giving them ſuch a *Contraction*, as may prevent its Paſſage; or in anſwering

ing both *Intentions:* But if it were in the Power of *Medicines* to give ſuch a Diſpoſition to the *Humours*, as might anſwer the firſt *Intention*; it muſt thence follow, that the *Blood*, which cannot paſs through the wounded Veſſels, is likewiſe incapable of paſſing through the Extremities of the other *Arteries*, whoſe leaſt *Diameter* is only capable of admitting one *Globule* of *Blood* to paſs, and is always leſs than the *Diameter* of the *wounded Veſſel*, and muſt therefore ſoon produce a fatal *Peripneumony*. If ſuch Medicines anſwer the other *Intention* by their *aſtringent* Quality, equally circulating through the *Lungs*, before they could obtain that Effect in the wounded Veſſels, they muſt produce the ſame Alteration in the Extremities of the *Arteries*; and thence likewiſe a *Peripneumony* muſt unavoidably follow: So that Medicines in this Caſe, can only prove uſeful, as they produce the Effects before mentioned, unleſs ſuch Perſons have an Art of conveying the Efficacy of their *Medicines* particularly to the *wounded Part*, which is ridiculous to ſuppoſe. *Phyſicians* have probably fallen into this Error, becauſe they obſerved that the *Diſcharge* of *Blood* generally ceaſes ſoon after the Uſe of their *Medicines*; but this, as I before took Notice, is the natural Effect of an *Hæmoptoe*; the *Veſſels* being thence emptied, and collapſed; and the Force of Circulation made very languid; for this Reaſon ſcarce one of a great Number dies of an *Hæmoptoe*, except in *acute Diſtempers*.

Neither doth the other *Claſs* of *Medicines*, which, from a miſtaken Notion of their Manner of acting, are called *Balſamics*, prove ſerviceable in that Reſpect; for the Operation of *Balſamics* in the Cure of external Wounds, conſiſts in affording a kind, ſoft *Medium* between the Air, and the Exhalations ariſing from the Wound; which by that Means being retained, a *topic Fever* is excited; whence the *extravaſated Humours* are converted into a *laudable Pus*; which is the *Baſis*, that connects the new, ſucceeding *Fibres*; this is the *natural Balſam*, and preferable to all others, which are moſt valuable the nearer they approach to this. And as a Wound ought to be but lightly covered with *artificial Balſams*, to anſwer this End; ſo the *Pus* muſt be always moſt gently deterged, or elſe the new, tender Fibres are thereby deſtroyed. *Internal Balſamics*, cannot be ſuppoſed to exert their Influence after this particular Manner; but their Operation conſiſts in *ſheathing* the *Aſperities* of the *Humours*, whence they are rendered leſs apt to irritate; and in relaxing, and making pliable the Veſſels about the *wounded Part*, that they may with the greater Eaſe ſhoot out the new *Fibres*, which reunite the *Wound*.

Hence it appears, that ſuch *Medicines*, as are only proper in this Caſe, ought to be *eaſily penetrating*, and *mild*; for if they be too *viſcid*, they promote new *Obſtructions* in the Extremities of the *Arteries* opening into the *Ulcer*. If they be not mild, and ſoft, they excite, inſtead of allaying, a greater Heat. On this Account, hot, active *Medicines*, ſuch as *Balſ. Sulph. Aniſat. Gilead.* &c.

are pernicious in this Caſe: And the Reputation they have acquired, is owing to the good Effects they produce, when given to Perſons of a full Conſtitution, whoſe *Lungs* are oppreſſed with cold, *viſcid Humours*: where they not only act as *Alteratives*, in attenuating, but as *Diuretics*, in diſcharging them by the urinary Paſſages.

Such a Management of the Non-naturals is to be directed, as is moſt agreeable to theſe *Intentions*. The *Body* muſt be kept as much as poſſible in a State of *Reſt*, even Speaking is improper, (while the *Wound* is freſh) as the *Lungs* are particularly agitated by that *muſcular Motion*.

A *Milk Diet*, carefully directed, is preferable in this Caſe to any other; as it is of a cooling, ſoft, nouriſhing Nature; requires ſcarce any Digeſtion, having already been prepared in the *Stomach*, and *Bowels*, and paſſed through the *Lungs* of the *Animal* it is taken from; and conſiſts partly of the natural *Juices* of that *Animal*, and the concocted *Juices* of *Graſs*, and other *open-*

ing Herbs; by which Means, it not only anſwers in every Reſpect the *Intentions* required, as it is *Balſamic*, and reſtrains too quick a *Circulation*; but ſeems ſpecifically to correct that *Acrimony*, ſo peculiar to conſumptive *Fluids*; which appears to be of an *urinous*, *ſaline*, Nature; ſuch as proceeds from a Mixture of *Salt Ammoniac*: This is confirmed by the Taſte, the florid Colour, and acrid Diſſolution of ſuch *Fluids*; which this Salt, and *Sal marinus*, by being mixed with the *Blood*, can alone produce. (But it is plain from a chymical *Analyſis* of the *Blood*, that *Sal marinus* is never conquered by the *Actions* of the *Body*, and aſſimilated to the other *Fluids*,) and ſuch an *Acrimony*, as it likewiſe appears by chymical Experiments, is beſt corrected by *Juices*, which are of an *aceſcent* Nature, tempered with ſomewhat *oleaginous*: If Cows Milk be apt to render them *coſtive*, it may conveniently be mixed with a ſmall Proportion of *Honey*, or exchanged for *Aſſes Milk*, which is more light, and opening, and leſs apt to curdle. *Breaſt*

Milk is more natural, and in every Reſpect preferable to any other; eſpecially if the Nurſe be of a healthy Conſtitution, and feeds on a proper cooling Diet.

If this Method be timely uſed, carefully continued, and ſuited to the Strength, and *Conſtitution* of the *Patient*, many may be thereby recovered, that will otherwiſe unavoidably periſh. For if *Bleeding* in a ſufficient Quantity be deferred for a few Days till the *Ulcer* is formed; it afterwards proves of no Service, but does rather haſten their Death. And nothing more certainly contributes to this, and is more fatal in the Conſequence, than any Error admitted in *Medicine*, or *Diet*, in the Beginning. For whatever is mixed with the Blood, or taken for Nouriſhment, as it receives its chief Alteration from the *Lungs*, and arrives there almoſt unchanged, ought more particularly to be ſuch as wants ſcarce any Preparation from them. And if it contains the leaſt *Acrimony*, or *Crudity*, by either *obſtructing*, or *irritating*, will unavoidably renew the *Hæmoptoe*, and increaſe the Collection of purulent Matter.

When this *Regimen* has been continued for the Space of two Months, or till all Remains of the Cough, and other Symptoms are carried off; gentle Exerciſe, and particularly Riding, in a free, dry Air, muſt be uſed when the Stomach is moſt empty, in the Morning, and Afternoon; that the *Veſſels* of the *Lungs* may be thereby ſtrengthned: A greater Latitude in Diet is to be admitted by careful Degrees, always avoiding whatever might give too great an *Acrimony*, and *Velocity* to the *Fluids*. And by way of Prevention, every ſix Months, at the *Vernal* and *Autumnal Æquinox*, gentle *Evacuations*, ſuch as *Bleeding*, and the moſt *cooling Purgatives*, as *Manna* diſſolved in thin Gruel, with the Juice of *Sevil Orange*, muſt be uſed: This Caution is of the greateſt Moment, as the Neglect of it has been fatal to many; for at ſuch Times the *Preſſure* of the *Air* being greatly diminiſhed, (*a*) the *Humours* become turgid, and by preſſing, and diſtending the *Veſſels* more than uſual, are thence particularly apt in prediſpoſed Perſons to bring on an *Hæmoptoe.*

An *Hæmoptoe* of the *Bronchial Arteries*, is not ſo dangerous as of the *Pulmonary Arteries*; and is eaſily cured by moderate *Evacuations*, and the Uſe of a cooling, ſoft Regimen.

When an *Hæmoptoe* proceeds from preceding *Obſtructions*, the ſame Method is to be uſed to prevent the Return, and the bad Effects of it; particular Regard being had to the original Cauſe of the *Obſtructions.*

It remains now to deſcribe this *Diſtemper* in its laſt Stage of an *Abſceſs*, or *Ulcer*, proceeding either from a preceding *Hæmoptoe*, or *Obſtructions*; with the moſt probable Method of Cure.

When either from a Neglect of a proper Method, the Uſe of improper Medicines, or the Violence of the Diſ-

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(*a*) *Vide* Mead *de imperio Solis & Lunæ.*

order, a difficult Reſpiration ſucceeds *Obſtructions*, or an *Hæmoptoe* of the *Pulmonary Arteries*, attended with a dry, laborious Cough, increaſed after Eating, or Motion, a hectic Fever, periodically increaſing with a great Anxiety generally towards Evening, Night Sweats, eſpecially about the Neck, and Breaſt, great Thirſt; and if Pain prevents lying on any but the affected Side, then theſe Symptoms plainly diſcover, that a *latent Abſceſs* is formed in the *Lungs*, either from a *Suppuration* of the *Veſſels* that were before *obſtructed*, or from an *Eſchar* being grown over the *ruptured Veſſels*, and the *purulent Matter* being thence retained: In the Progreſs of this Diſtemper, the Symptoms grow more violent, the *Body* gradually conſumes away, moſt of the *Humours* degenerating into *Pus*, the *Eyes* become hollow, the *Noſe* ſharp, the *Temples* collapſed, the *Scapulæ* prominent like Wings, red *Puſtules* frequently appear in ſeveral Parts of the *Body*, with the greateſt Degree of Weakneſs, a hoarſe Voice, ſwelling of the

Hands, and Legs; and the Tragedy is generally finiſhed by a *Diarrhæa.*

An *Abſceſs* of the *Lungs* variouſly terminates, ſometimes (*a*) it continues latent and perpetually increaſes producing a gradual Decay with the *Symptoms* now deſcribed: Sometimes (*b*) it breaks into the Cavity of the *Thorax* or *Mediaſtinum* producing a fatal *Empyema.* Sometimes (*c*) its Diſcharge is ſo ſudden and violent into the *Trachæa,* as to produce an immediate Suffocation. But moſt frequently the Eruption is more gentle into this Place, when the Aperture is but ſmall, and then becomes an open *Ulcer,* daily diſcharging by a Cough *purulent Matter,* whoſe Colour, and other Qualities are altered according to the Nature, and Duration of the Abſceſs. Sometimes ſweet, and fetid; its Conſiſtence thin and *ichoroſe,* or *concocted*; its Colour

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(*a*) *Bonet. Anatom. Practic. Tom.* 1. *Lib.* 2. *Sect.* 7. *Obſ.* 38. *Obſ.* 74. *Tulp. Lib.* 2. *Obſ.* 10.

(*b*) *Bonet. Anatom. Practic. Tom.* 1. *Lib.* 2. *Sect.* 6. *Obſ.* 12. *Sect.* 7. *Obſ.* 12. *Obſ.* 20. *Obſ.* 29.

(*c*) *Tulp. Lib.* 2. *Obſ.* 10. *Bonet. Anat. Pract. Tom.* 1. *Lib.* 2. *Sect.* 2. *Obſ.* 11.

ſometimes white, red, yellow, livid, duſty, or variouſly tinged: The fatal Symptoms in the Progreſs of this *Diſtemper*, are in every Reſpect the ſame as before deſcribed, except that the *Oppreſſion* and Difficulty of Breathing are not ſo violent, neither is the *Hectic Fever* ſo intenſe and conſtant; the *Lungs* being often relieved from a Load of *purulent Matter* by *Expectoration*, which in a *latent Abſceſs* had no other Way of being diſcharged but by being firſt mixed with the Blood.

An external Wound, a *Peripneumony*, or a *Pleuriſy* not reſolved, but ending in a *Suppuration*, may likewiſe produce ſuch an *Abſceſs*; for in this Caſe the *Lungs* moſt frequently adhering to the inflamed Part of the *Pleura*, are at length affected after the ſame Manner.

A Suppuration proceeds from an *Hæmoptoe*, or *Obſtructions* of the *Bronchial Arteries* not rightly carried off, in a Manner ſomewhat different; for in the former Caſe an *Expectoration* of purulent Matter quickly ſucceeds the *Hæmoptoe*;

in the latter the obſtructing *Phlegm* by more ſlow Degrees acquires a Putrefaction, diſtends and erodes the *Veſſels*. The more the Diſtemper advances, the greater Quantity of *purulent Matter* is mixed with the *Phlegm*, the *Hectic Fever*, Thirſt, Night Sweats, and other Symptoms increaſe in the ſame Proportion, and the *Cataſtrophe* is finiſhed after the ſame Manner which before has been deſcribed; for when the *Bronchial Arteries* are obſtructed, or ſuppurated, the *Pulmonary Veſſels* by being compreſſed or eroded, are at length affected after the ſame Manner.

That Side which is *impoſthumated*, or *ulcerated*, is more warm, and has a greater Senſe of Weight than the other. Lying on the contrary Side often produces almoſt a *Suffocation*, the Cough, and Oppreſſion being thereby greatly increaſed. But by lying on the affected Side, the Sleep is more undiſturbed, the *Pus* better concocted, and more freely *expectorated*, and all the Symptoms are eaſier: This Alteration is owing to the *Circulation* being chiefly continued in this Caſe through the ſound *Lobe*, which in that Poſture is compreſſed, and the Motion of the *circulating Blood* thence obſtructed, by the Weight of *purulent Matter*, preſſing down the *Mediaſtinum*.

Whoever rightly conſiders the Nature of the *purulent Matter* contained, whoſe Acrimony perpetually increaſes, the great Quantity of *Blood*, and the Force with which it paſſes through the *Lungs*, the ſurprizing Tenderneſs of their Fabrick, all conducing to their eaſy Deſtruction, and that the moſt *material Functions* of Life depend on their Welfare, may evidently account for all the Symptoms, and Effects of this Diſtemper. Among which, none is of greater Moment, and more taken Notice of, than the *Hectic Fever*, (ſo termed becauſe it is *habitual* to the *Conſtitution.*) It has a various Origine, but in *Phthiſical* Perſons is moſt frequently owing to the great Quantity of *purulent Matter* mixed with the *Blood:* For when any *Body*, *foreign*, or acrimonious, is mixed with the *Hu-*

mours, a Fever is thence excited; by which Means it is either aſſimilated or expelled: Sweats are generally the *critical Diſcharge*, which Nature attempts in *putrid Fevers*; and will in *Phthiſical* Perſons be moſt profuſe at Night, being then particularly determined there by the Warmth of the Bed, the Laxity of their *Pores*, and the great Diſſolution, and imperfect Mixture of their *Humours*. (The *Lungs* being incapable of giving them a proper Conſiſtence.) The periodical Increaſe of the *Hectic Fever* is moſt remarkable in the Evening; the firſt *Digeſtion* of the *Food* taken for Dinner being finiſhed about that Time, and the crude viſcid Chyle, which then enters the *Blood*, ſoon obſtructs, and inflames the Extremities of the *Veſſels* that open into the *Abſceſs*, or *Ulcer*; whence a Fever being excited, the obſtructed Parts are either reſolved, or with the *Humours* contained, and ſtagnating in the *Cavity*, are reduced into *Pus*; which is the *natural Balſam*, that can only connect the new ſucceeding *Fibres*; and as (*a*) *Hippocrates* has obſerved, cannot be formed without a Fever. By this *periodical Fever*, an immediate *Suffocation* from theſe conſtant new Obſtructions is prevented, the *Pus* in the Cavity is concocted, and the *Humours* depurated, by critically diſcharging the *purulent Matter*, mixed with the *Blood*, and then the Fever ceaſes; but whenever there is a ſufficient freſh Collection, or new *Obſtructions* are formed, it returns again, and gives the ſame Aſſiſtance as before. Thus the unhapy Patient, by this unavailing Attempt of kind Nature, is ſucceſſively relieved, and oppreſſed, and gradually languiſhes away: Hence at length the Legs and Hands begin to ſwell; the Force of *Circulation* being very languid, and not ſufficient to propel the *Humours*; which are particularly apt to ſtagnate in this Place from the Reſiſtance of theſe *Veſſels*, and being at the greateſt Diſtance from the firſt Cauſe of Motion. The

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(*a*) *Lib.* 2. *Aph.* 47.

Thirſt, *Loſs of Appetite*, *Falling of the Hair*, the *red Puſtules*, and all the other *Symptoms*, may be eaſily deduced from the univerſal Acrimony and Putrefaction of the *Humours*; which at length being almoſt totally reduced into *Pus*, and not having any longer a ſufficient *Momentum* to determine them to the Surface of the *Body*, are conveyed through the *Meſenteric* and *Cæliac Veſſels*; obſtruct, and exulcerate them, become more fetid, and acrimonious, and thence irritate, and determine the Courſe of the remaining circulating *Humours* to theſe Parts; by which Means *Expectoration* is ſoon ſuppreſſed, and the *Tragedy* finiſhed.

That *Phthiſis*, which is hereditary, and proceeds from a Conſtitution inclined to that Diſtemper, is moſt commonly fatal. And ſuch are ſcarce to be relieved but by ſuch a Management as might prevent an *Hæmoptoe*: Whereas a *Phthiſis* that proceeds from too violent Motion ſuddenly given to the *Blood*, or from an external Wound, where the Fluids and Solids are in general well diſpoſed, is more eaſily cured.

That *Phthiſis* is particularly dangerous, which ſucceeds a Suppreſſion of the *Menſtrua* in Women, and cannot be carried off by any Means unleſs that natural Diſcharge be reſtored; (*a*) neither can the Progreſs of a *Phthiſis* from a Suppreſſion of the *Hemorrhoids*, be ſafely prevented but by an Aperture of them.

That *Phthiſis* which proceeds from an *Hæmoptoe*, or preceding *Obſtructions* of the *Bronchial* Arteries, is not ſo dangerous, nor ſo quickly fatal, as from an *Hæmoptoe* of the *Pulmonary* Arteries: In this Caſe, a Solution, and Recovery may be expected, if the *purulent Matter* be ſoon, and totally diſcharged, before by long Continuance it grows putrid, and affects the *Pulmonary Veſſels*.

That *Phthiſis* which proceeds from preceding *Obſtructions*, or an *Hæmop*-

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(*a*) *Hippoc. Q. Prorrh.*

toe of the *Pulmonary* Arteries, is curable if the *Abſceſs* breaks ſoon, and diſcharges eaſily by *Expectoration* purulent Matter, of a white Colour, well digeſted; of an equal Conſiſtence; and free from Putrefaction; if the Fever, Thirſt, and Difficulty in Breathing immediately abate, if the *Excrements* be ſoft, and well figured: But if the Fever ſtill continues, or returns periodically in a violent Manner, if the Appetite languiſhes, and Thirſt increaſes, if the *purulent Matter expectorated* be of a pale, green, or livid Colour, not concocted, but pituitous and frothy, and a *Diarrhæa* ſucceeds, the Caſe is then moſt deſperate.

That *Phthiſis* which is attended with a Diſtention, or Hardneſs of the *Hypochondria*, is particularly dangerous; for ſuch a Diſpoſition argues a Defect in the *Chylopoietic Bowels*, and thence an Inapitude to repair the great Decays which are the conſtant Effects of this *Diſtemper*.

When an *Abſceſs* is formed, the Indication is to *ripen*, and break it as ſoon as poſſible; and thereby reduce it to an *open Ulcer*.

When an *Abſceſs* is fully maturated, the *Rupture* of it is to be determined externally into the *Aſpera Arteria*, (to prevent an *Empyema*) by macerating theſe Parts with the Vapour of emollient Herbs, and then by Exerciſe in a Chair, or Riding, and the Uſe of ſomewhat ſtimulating to promote *Expectoration*: For the *Lungs* thus diſpoſed, being moved, and irritated, the *Abſceſs* will moſt probably break into the *Aſpera Arteria*, where there is the leaſt Reſiſtance.

This Effect may be likewiſe obtained, by giving a gentle Vomit of *Oxym: Scillit*. and *Ol. Amygd. dulc*. after a previous Maceration.

The following Forms of an emollient Vapour, and an *expectorating Mixture*, are compoſed of *Materials* moſt ſuitable to theſe *Intentions*.

℞
Fol. Malvæ.
——*Biſmalv.*
——*Mercurial.*
——*Parietar.* *āā* mij
Farin. Sem. Lini. ℥ij

Cum aq. decoct. vaporem excipe cum aere adducendo.

℞

Aceti Scillitici	℥iv
Oxymel. Scillit	℥iij
Sal. Polychreſt.	ʒi
Aq. decoct. hord.	℥viij
——*Hyſſop*	℥iv

Bibat ℥i *omni horâ dimidiatâ.*

When an open *Ulcer* is formed, the *Indications* are 1*ſt*. To prevent the *Ulcer* from increaſing, and to defend the Blood from the *purulent Matter* mixed with it. 2*dly*. To cleanſe and heal the Ulcer.

The former *Intention* is anſwered by ſuch Medicines, which are ſo light, and aperient, as eaſily to paſs through the *Lungs*, without forming new *Obſtructions*

ons about the ulcerated Part; (which being afterwards inflamed and ſuppurated, increaſe the *Hectic Fever*, and univerſal Decay, and particularly enlarge the *Ulcer*) and by being *Vulnerary* and *Balſamic*, correct, and ſoften the Acrimony of the *Humours*, and defend them from Putrefaction; for unleſs this bad Diſpoſition of the Fluids be corrected, the *Pus* which from thence is formed, muſt unavoidably partake of the ſame Nature; and rather contribute to erode, and irritate, than afford a kind natural *Balſam*, fit to ſuſtain, and connect the new ſucceeding *Fibres*; without which no *Ulcer* can ever be healed.

The following Medicines are ſuitable to this Intention, *viz. Fol. agrimon. Betonic. hæder. terreſt, Scabios, Tuſſilag. Pulmonar. Chamædryos, Chamæpyt, Chærophyl, Capil. vener. Flor. Bellid. maj. Betonic. Verbaſc. Hyperic. Altheæ. rad. Glycyrrhiz, Bardan*, &c. and are beſt given in the Form of a Decoction, becauſe in no other they can ſo eaſily paſs through the *Veſſels*, and communicate their Virtues to the Blood; and may in this Caſe be ſtrictly called *vulnerary*; for a Decoction only deſerves that Name, as it corrects any bad Diſpoſition of the *Humours* which prevents a Wound from being healed; and is therefore in other Caſes to be varied according to the different Conſtitution, and Symptoms of the Patient.

Gum Galban, *Opoponac*, *Ammoniac*, *Myrrh*. *Maſtich*, *Oliban*. *Sperm. Ceti*, *Sapo. venet. Terebinth*, &c. made up into Pills, and taken with ſuch a Decoction, are frequently neceſſary: As they are opening, and prevent new Obſtructions from being formed about the ulcerated Part; and in ſome Meaſure likewiſe contribute to anſwer the *ſecond* Indication, as they gently ſtimulate, and promote Expectoration.

The *ſecond* Intention, is anſwered by the Uſe of ſuch Medicines, as promote a Diſcharge of the purulent Matter in the *Ulcer*, by *Expectoration*; and of that mixed with the Blood, by Urine; and by the Uſe of conſolidating Paregoricks, which contribute to reunite the Wound.

All the former Medicines, as they are ſoft, and gently deterſive, contribute to anſwer this Intention. But the following are more active and powerful, *viz. Fol. Veronic. Maris. Rutæ, Valerian. hortens. Hyſſop. Virgæ aureæ, Marrub. alb. Scord. Scabios. Puleg. Flor. centaur. minor, rad. Fænicul, Petroſelin,* &c. with Preparations of *Honey*, and the *Sea Onion*.

The *Materia Medica*, abounds with a great Variety of Medicines of this Nature, out of which ſeveral Forms, and Decoctions may be eaſily compoſed in different *Menſtruums*; either in common Water, Milk and Water, or Whey; according to the different Symptoms, and Conſtitution of the Patient. For when the *Humours* have a *ſaline Acrimony*, and the Quantity of *purulent Matter* is not great, and Expectoration is eaſy; the more mild *Balſamic*, and gently deterging Decoctions are neceſſary: But where Expectoration is difficult, the *Ulcer* foul, and the Quantity of *purulent Matter* is great, more active ſtimulating Medicines are required.

Nothing is of greater Service in this Diſtemper than the conſtant Uſe of *Anodyne Medicines*, ſuch as *Syrup de Mecon. Pil. de Styrac*, *Cynogloſs*, &c. in a proper Doſe, taken every Night going to Reſt at an early Hour. How far Sleep contributes to the general Nouriſhment of the Body, and by that Means gives Strength to the Solids, and preſerves a due Texture in the Fluids, has been already ſhewn (*a*). But beſides theſe Advantages, it is in this Diſtemper farther neceſſary: For by allaying the uneaſy Irritations, which excite the Cough, they give Reſt to the weak and wearied *Lungs*, and can alone give the *purulent Matter* that *Balſamic Conſiſtence*, ſo neceſſary to the Reunion of the ulcerated Part. For by this Means, what is expectorated next Morning, will be mild, and well digeſted, which would otherwiſe be *ichoroſe* and *acrid*.

The Shirt, and Bed Linnen of a Perſon thus affected, ought always to

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(*a*) *Vide p.* 64.

be carefully warmed, and dried before he goes to Reſt; for being generally damped by the Remains of former Sweats, which by ſtagnating acquire a greater *Acrimony*, and being eaſily diſſolved by the Heat of the Body, they compoſe a *moiſt*, *putrid Atmoſphere*; which greatly contributes to their Uneaſineſs, and the Increaſe of the *Nocturnal Sweats*.

No Nouriſhment is proper in this Stage of a *Conſumption*, that is not light, cooling, and oppoſite to *Putrefaction*: For whatever is of a different Nature, will in this Caſe increaſe the Decay, notwithſtanding in another it might be moſt nouriſhing: Hence all *Animal Diet* is pernicious, becauſe ſo apt to putrify, eſpecially when expoſed to a great Degree of *Heat*: And will thence more eaſily acquire this Diſpoſition, when received into *conſumptive Bodies*; where the Heat is not only very *intenſe*, but moſt of the *Humours* are inclined to *Putrefaction*, and ſome of them are actually *putrid*. For the purulent Matter expectorated from the *Lungs*, is generally fetid, or quickly becomes ſo by being thrown on warm Coals: In this Reſpect therefore whatever increaſes the Heat, increaſes the *Putrefaction*; (and *vice verſâ*) and that all *Animals* are more apt to excite a greater Heat than *Vegetables*, is moſt evident from common Obſervation; and the Reaſon of this, ſeems chiefly to be owing to the *Salts* of *Animals* being *volatile*; whereas the *Salts* of moſt *Vegetables* are of a *fixed* Nature; and thence when received into the *Blood* remain inactive, and quiet: Whereas the former by the Heat of the Body being *volatilized*, and made active, not only excite a greater Agitation in the *Fluids*, but ſtimulate the *Solids* to ſtronger and quicker *Vibrations*: This is the chief Reaſon, why *Alkaline Medicines* in general increaſe, and *Acids* retard the Motion of the *Humours*: All the former containing a *volatile Salt*, and all except a few of the latter, having a *fixed Salt*. Hence *Providence* has wiſely ordained, that ſuch *Animals* as are moſt uſed in common Food, are tempered by feeding

ing on *acid*, *cooling Vegetables*; which in a great Meaſure contribute to preſerve us from *Fevers*, and ſuch Diſorders as are the Effects of *increaſed Heat*, and *Putrefaction*; which *wild Fowl*, and ſuch *Animals* as feed on *Animal Diet*, are apt to produce, the *Salts* of theſe being much more naked, and active, than of the former.

The Inhabitants of theſe *Iſlands*, and particularly the better Sort, are in a great Meaſure ſo remarkably ſubject to an *Hæmoptoe*, and thence a *Phthiſis*, from their exorbitant Uſe of an *Animal Diet*, *high Sawces*, and *ſpirituous Liquors*; their *Solids* being naturally tender, and eaſily deſtroyed by the *Acrimony* and *Velocity* of the *Fluids*: And ſo few are recovered, becauſe the ſame *Food* is often imprudently directed as a *Remedy*, which frequently laid the firſt Foundation of the Diſorder. For *Jellie Broth*, *Jellie* of *Harts-horn*, and *Calves Feet*, ſo much eſteemed by ſome for being *nouriſhing* and *Balſamic*, are not only ſubject to all the Inconveniences of an *Animal Diet* already mentioned, but (the *finer Parts* by long boiling being exhaled) are leſs nouriſhing than a *light Broth*; and by their great *Viſcidity* are particularly deſtructive, as they thence increaſe the *Obſtructions*, *Hectic Fever*, and *univerſal Decay*: The Mixture of *Wine* and *Acids*, gives a grateful Taſte to ſuch Preparations, which would otherwiſe be moſt nauſeous: And notwithſtanding the beſt Management, they are not only certainly pernicious, but frequently diſagreeable to ſuch Perſons.

A *Milk Diet*, taken after the Manner before directed, anſwers all the *Intentions* required in this Caſe; being of an *aceſcent Nature*, already digeſted, and prepared in the *Body* of the *Animal* it is taken from; and is moſt fit to repair the great Decays of conſumptive Perſons, and recruit their exhauſted Spirits; for no Parts are more plentifully ſupplied with a greater Number of *Nerves* than the *Breaſts*; and as they are not expended on any *muſcular Motion*, their Uſe moſt probably conſiſts in ſupplying this *Juice* with a large Proportion of *Animal Spirits.*

Sometimes this Diet is apt to diſagree by curdling in the *Stomach* of weak Perſons, that have a ſlow, languid Digeſtion, notwithſtanding the greateſt Caution is uſed to prevent it, by taking *Sapo Venet. teſtaceous Powders*, and diluting it with Water: For as ſome Part of the former Meal of Milk moſt commonly remains in their *Stomach*, it will there as certainly curdle, and become *acid*, as if expoſed to the Heat of the *Sun* for the ſame Space of Time, (the Heat of the *Stomach*, eſpecially in *Hectic Conſtitutions*, being at leaſt equal to that Heat.) For which Reaſon it will unavoidably alter and give the ſame Diſpoſition to what freſh, new Milk is taken. But if the *Stomach* between each Meal is waſhed from any former Remains by ſomething that is light, and not apt to turn acid, (ſuch as the White of a new-laid Egg, diſſolved Blood-warm in Barley-water; lighteſt Broth made from tender young *Animals*, which in this Caſe may be ſometimes

times allowed, *Water Chocolate*, or a weak Tincture of the *Bark*) the next Meal of *Milk* will certainly then ſit light, and eaſy on the weakeſt *Stomack*, to which before it was diſagreeable.

Exerciſe in a *free Air*, and particularly *Riding*, is moſt ſerviceable in this laſt Stage of a *Conſumption*: For by enlarging the Capacity of the *Thorax*, and giving a ſtronger Force to the *Organs* of *Reſpiration*, it greatly promotes *Expectoration*: And by giving a more compact, and homogeneous Texture to the *Humours*, prevents in a great Meaſure the *Night-Sweats*, which not only proceed from the Mixture of *purulent Matter*, but from the Action of the *Lungs* not being ſufficient to give the *Humours* a proper Conſiſtence; Part of whoſe *Veſſels* being now deſtroyed, and the remaining being weak and languid, ſtand in the greateſt Need of this *artificial Aſſiſtance*.

The *Medicines*, and *Diet*, that I have here recommended ſeem to promiſe the greateſt *Relief* in this *difficult* *Di-*

Diſtemper; as they defend the *Blood* from the *purulent Matter* mixed with it, and are ſo mild, and penetrating, as not to obſtruct or irritate the *Lungs* in paſſing through them; and are thence alone capable of allaying the *Hectic Heats*, and the Increaſe of the other fatal Symptoms: 'Tis ſurprizing that the Nature of this Diſtemper has not hitherto been better regarded by practical Authors, ſince 'tis obvious to the moſt common Obſervation, that whenever the crude *Chyle* enters the *Blood*, the *Hectic Heats* increaſe in Proportion to its Quantity and Viſcidity; and that few Phthiſical Perſons die, before what they expectorate is perfectly putrid: Probably moſt of them have run into a Neglect of ſuch a Method, and the Uſe of *Alkaline Medicines*, (improperly called Sweetners of the *Blood*) from a Miſunderſtanding of an Obſervation of *Hippocrates*, *Acida ſunt pectori inimica.* But this Precept has a Regard only to ſuch acid Particles as are inſpired into the *Lungs* with the Air; ſuch as the *Effluvia* of *Arſenick*, *Mercury*, *Sulphur*, &c.

which are certainly moſt deſtructive: For no Medicines were ſo much uſed by *Hippocrates* in internal Diſorders of the *Lungs*, as Preparations of *Milk*, and his beloved *Oxymel*.

Some Authors have eſteemed an *Ulcer* in the *Lungs* incurable; while others, running into a contrary Error, and depending too much on the Force of their Medicines, ſeem to be not ſufficiently ſenſible of the Danger that attends it. But whoever conſiders the Structure of the *Lungs*, and that no *Ulcer* can be healed but with the greateſt Difficulty, unleſs it be carefully cleanſed, kept in a State of Reſt, and that the *Humours* arriving at it be mild, and well diſpoſed, may eaſily conceive why this Diſtemper is ſo difficult to cure, and is ſo generally fatal; for the great Uſefulneſs of the Part affected, (on whoſe Welfare the good Diſpoſition of all the *Fluids*, and the moſt material Functions of Life depend) its Situation, and conſtant Motion, powerfully contribute to prevent theſe Advantages: And the *Cough*, which Nature moſt conſtantly uſes in this Caſe as the Inſtrument to diſcharge the *purulent Matter*, and cleanſe the *Ulcer*, by its too violent Motion is apt to enlarge it, and increaſe the univerſal Decay: By this Means that which by the natural Efforts of the *Animal Oeconomy*, is deſigned for the greateſt Friend, frequently proves the moſt deſtructive Enemy.

The Method which has been here deſcribed, obviates as much as poſſible theſe Inconveniencies; and will be attended with unexpected Succeſs, if carefully obſerved before the Diſtemper be too far advanced, and the *Solids* and *Fluids* decayed, and corrupted: But when from the Violence of the Diſtemper, or the Neglect of a proper Method, the Symptoms are ſo far increaſed as to carry a fatal Aſpect, and elude the Force of the moſt effectual Medicines, inſtead of amuſing the unhappy Patient with falſe Hopes, and the repeated Uſe of *Palliative Remedies*, or denouncing certain Death, it would be of the greateſt Uſe, if a Method could be propoſed, which tho' dubious and painful in the Operation, may give the afflicted ſome Chance for their Life: *Præſtat anceps quam nullum experiri Remedium.*

Such a probable Relief can only be expected by opening the Breaſt, where the moſt frequent Pain, and Oppreſſion, direct the Situation of the *Ulcer*. And that no ſmall Proſpect of a Recovery might be expected in ſeveral Caſes from this Operation, may be moſt evidently proved from what has appeared in the Diſſection of ſuch as have died of this Diſtemper; eſpecially when proceeding from a previous *Hæmoptoe* of the *Pulmonary Arteries*; in which Caſe the Sides of the impoſthumated or ulcerated Part of the *Lungs*, have been moſt conſtantly obſerved to adhere to the *Pleura*: (*a*) By which Means, as if carefully deſigned by Nature, the affected Part is placed in a proper Con-

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(*a*) *Vid. Bennet. Theat. tabid. exercit.* 16. *pag.* 95. *Fernel. Conſil.* 20. *Willis Pharamaceut. Rational. Sect.* 1. *Cap.* 10. *Carol. Piſo de morb. a colluvie ſeroſâ. Sect.* 3. *Cap. ult. Tulp. Obſ.* 4. *lib.* 2. *Bonet. Anatom. Pract. Tom.* 1. *lib.* 2. *Sect.* 4. *Obſ.* 9. *Sect.* 5. *Obſ.* 2. *Sect.* 7. *Obſ.* 38, & 39.

dition of being thus relieved; and is kept more in a State of *Reſt* than any other Part of the *Lungs*: So that nothing of Moment ſeems to prevent a Recovery, if the Operation be rightly performed; for the new *Orifice* effectually ſupplying the Place of the opening into the *Aſpera Arteria*, the *purulent Matter* may be ſafely evacuated without the Inconveniencies that attend *Expectoration*, and the *Wound* moſt effectually cleanſed and cured by deterging and healing *Injections*.

That *Abſceſſes* and *Ulcers* in the *Lungs* may be thus artificially diſcharged, is not only agreeable to the ſtricteſt Reaſoning on this Subject, but has been confirmed by Experience. I ſhall only mention one Obſervation, which moſt remarkably confirms the Truth of what has been delivered. (*a*) A Soldier received a *Wound* with a Sword, penetrating through the *Ribs* into the Cavity of the *Breaſt*, from whence a ſmall Quantity of *Blood* was external-

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(*a*) *Miſcellan. Curioſ. Ani. 6ti. Obſ.* 41.

ly diſcharged: The *Surgeon* who attended him not conſidering the Conſequence, quickly healed the *Wound*; which was ſucceeded with a *Cough*, *Hectic Fever*, and a great Difficulty of Breathing: Theſe Symptoms were particularly violent in the Night; and at length he *expectorated* by Coughing a conſiderable Quantity of *purulent Matter.* In this decaying Condition he remained for ſome Time, till by the Order of a *Phyſician* the *wounded Part* was again opened by *Inciſion*, which immediately diſcharged a great Quantity of *purulent Matter* with as much Force as *Blood* flows from a *Vein*: The *Cough*, *Hectic Fever*, and Difficulty of Breathing, by this Means ſoon abated, and by the Uſe of proper Applications the Perſon was reſtored to perfect Health.

It is moſt certain that the *Lungs* of this Perſon were ulcerated, and adhered in that Part to the *Pleura*; and that he muſt in all Probability have languiſhed away, if not relieved by the *Aperture*. And tho' in this Caſe the

Phyſician was plainly directed to that *Operation*, becauſe immediately after healing the *Wound* ſuch bad Symptoms appeared: And it was therefore obvious to conclude, that by the ſame Paſſage the *Wound* was received, its Effects may be moſt eaſily carried off: Yet when there is ſuch an *Adheſion* from an *Abſceſs*, or *Ulcer*, proceeding from an *internal Cauſe*, there is almoſt equal Reaſon to expect Succeſs from ſuch an *Aperture*; for the only Difference that appears in theſe Caſes is that the former proceeded from an external *Wound*, but attended with a good Habit of Body; the latter from an internal Cauſe, and originally occaſioned by a bad Diſpoſition of *Humours*; which may be eaſily corrected by the Method here deſcribed.

When the *Lungs* are *ulcerated* in various Places from *preceding Obſtructions* or an *Hæmoptoe*, no Relief can be expected by this Means, but when an *Abſceſs* or *Ulcer* is formed from a *preceding Hæmoptoe* of the *Pulmonary Veſſels*, and the *Lobe* affected is not much deſtroyed, I ſee no Reaſon why it may not be performed with at leaſt as much Probability of Succeſs as in an *Empyema*; in which Caſe a Recovery may be expected, if the *purulent Matter* be not depraved by a long *Stagnation*, and has not given a *fatal Eroſion* to the other Parts; eſpecially if the *purulent Matter* thus diſcharged be of a white Colour, and of an equal Conſiſtence; but if it be tinctured with a red Colour, and is impure and fetid, or if what is diſcharged on the firſt Day has a deep Hue like the Yelk of an Egg, or if on the ſecond Day it be of a thick Conſiſtence, a pale, green Colour, and of a fetid Scent, the Caſe is then fatal. Theſe *Prognoſtics* which always hold good in an *Empyema* (*a*) may with equal Reaſon be applied to this Caſe after *Inciſion*; and may be as juſtly formed before the *Operation*, as the Nature of the *purulent Matter* contained in the *Ulcer*, is evident from what is *expectorated*, which in an *Empyema*

(*a*) *Hippoc.* 1, *et* 2. *de m. et* 7 Aphoriſm.

cannot often be diſcovered till after *Inciſion*.

'Tis ſurprizing that this Method has not been frequently attempted, ſince it is founded on ſuch plain, and eaſie Reaſoning from *Anatomical Obſervations*; tho' I'm ſenſible there are ſeveral Obſtacles that will always oppoſe it: For the quick Return of Eaſe that ſucceſſively follows the oppreſſing Anxiety which attends the *Hectic Heats*, affords ſuch a deceitful Proſpect of a Recovery, that theſe unhappy Perſons are ſcarce ever to be convinced their Diſtemper will be ſoon fatal to them. Neither are *Phyſicians* willing to hazard the Reputation they have gained, by adviſing an *Operation* that is eſteemed ſo deſperate; eſpecially when others are never wanting, who out of Ignorance or a baſe Deſign would be apt to cenſure ſuch a Proceeding. But 'tis moſt certain, that many *Phthiſical Perſons* may by this Means be preſerved, that will otherwiſe unavoidably periſh: If the *Operation* be rightly performed, there is great Reaſon to expect Succeſs, neither if it fails, can it be attended with any great Danger, or much contribute to haſten their Fate.

Thus I have endeavoured after the moſt plain, and rational Manner, to account for the various Origine, and Progreſs of this Diſtemper, through its different Stages: And without forming any deceiving *Hypotheſis*, have ſhewn how a Collection of *purulent Matter* in the *Lungs*, can only proceed from *previous Obſtructions* of the *Veſſels*, or a *Solution* of their *Continuity*: There is no Diſeaſe perhaps which rightly to explain, requires a more univerſal Knowledge of the *Animal Oeconomy*; and which hitherto has been deſcribed after a more imperfect, confuſed Manner. In this *Treatiſe* I have propoſed rather to lay down a right Account of this *Diſtemper*, than to examine the Errors of others: But however, I cannot well avoid mentioning the Author of a late *Hypotheſis* (*a*)

(*a*) *Martin* on Conſumptions, p. 50, 51.

which ſome may be more inclined to believe, ſince no leſs than *ocular Demonſtration* is offered to confirm the Truth of it. This Perſon takes Notice, that *Ulcers* in the *Lungs* when narrowly viewed with *Microſcopes*, are covered with ſeveral *Inſects*, and from thence concludes that they take their firſt Origine from ſuch *Animalcules*, which being inſpired with the Air, fix their Situation on the *Lungs*, and erode and ulcerate the *Veſſels*: And from the ſame irregular Way of Reaſoning, theſe *Animalcules* have been by others ſuppoſed the Cauſe of ſeveral Diſtempers, and particularly ſuch as are *contagious*: But theſe Appearances may be eaſily accounted for, as the unavoidable Effects, not the Cauſes of theſe Diſeaſes: For it is certain, that there is almoſt an infinite Number and Variety of ſuch *Animalcules* perpetually floating in the Air, whoſe chief Buſineſs conſiſts in ſearching out a Place where they may find Nouriſhment, and a proper Situation for themſelves and their young: But every ry living Part of a human Body has a perpetual Pulſation, which tho' imperceptible to our Eyes, is ſufficiently ſtrong to give the moſt uneaſy Motion to theſe *Animalcules* ſo minutely ſmall; and entirely prevent them from fixing there for any Time: But as there is no Circulation in any Part that is ulcerated, the Inconvenience of this Pulſation immediately ceaſes, and the *purulent Matter* ſends forth perpetual Steams, fit to nouriſh them; and by being viſcid and adheſive, makes their *Nidus* ſo ſecure, that the Motion of the *Veſſels* under the ulcerated Part is not ſtrong enough to diſlodge them: After the ſame Manner, the Blaſts of Trees, and Plants, may be more rationally accounted for, than by bringing ſmall *Animalcules* and their *Eggs* ſo many hundred Leagues to produce theſe Alterations. For there is a Circulation of *Humours* through every Part of Plants, and Trees, and in their aerial Tubes a more remarkable Pulſation, which is ſufficiently ſtrong to prevent theſe *Animalcules* (perhaps more minute than ſuch as are obſerved on *Animal Bodies*) from having a fixed and ſafe Situation there: But whenever any particular Wind, or Alteration of the Air, by either giving a ſudden Contraction to their *tender Veſſels*, or a *Viſcidity* to their *Juices*, produces a *Stagnation*, and thence a *Gangrene*, either in any particular Part, or in the whole, ſuch *Animalcules* will quickly ſecure this quiet State, and Nouriſhment.

FINIS.

ERRATA.

Page	Line	for	read
5	10	and into	and if into
18	18	it's Sides	their Sides
31	10	it's Veſſels	their Veſſels
47	10	*abraided*	*abraded*
78	3	leſs Space	ſhorter Space
79	7	leſs Space	ſhorter Space
115	7		*dele* For
136	15	*Perſpiration*	Diſcharge of *Urine*
138	20		*dele* (*b*)
140	6	*Beginning*, *Decay*	*beginning Decay*
144	26	*Terebinth*: *Balſam*	*Terebinth*: and *Balſam*
171	26	*Sinctus*'s	*Linctus*'s